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Eurasian Studies in Business and Economics 28
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Mehmet Huseyin Bilgin
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Ender Demir
Manuela Zipperling *Editors*

Eurasian Business and Economics Perspectives

Proceedings of the 41st Eurasia Business and Economics Society Conference



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Eurasian Studies in Business and Economics

Volume 28

Series Editors

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Eurasian Studies in Business and Economics is the official book series of the Eurasia Business and Economics Society (www.ebesweb.org). Each issue of the series includes selected papers from the EBES conferences. The EBES conferences, which are being held three times a year, have been intellectual hub for academic discussion in economics, finance, and business fields and provide network opportunities for participants to make long lasting academic cooperation. Each conference features around 250 research articles presented and attended by almost 500 researchers from more than 60 countries around the World. Theoretical and empirical papers in the series cover diverse areas of business, economics, and finance from many different countries, providing a valuable opportunity to researchers, professionals, and students to catch up with the most recent studies in a diverse set of fields across many countries and regions.

Mehmet Huseyin Bilgin • Hakan Danis
Ender Demir • Manuela Zipperling
Editors

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Preface

This is the 28th issue of the Springer's series **Eurasian Studies in Business and Economics**, which is the official book series of the Eurasia Business and Economics Society (EBES, www.ebesweb.org). This issue includes selected papers presented at the 41st EBES Conference—Berlin that was held on October 12–14, 2022, and hosted by **the FOM University of Applied Sciences, Berlin, Germany. The conference was held in hybrid with both in-person and online paper presentation format.**

We are honored to have received top-tier papers from distinguished scholars from all over the world. In the conference, *215* papers were presented and *440* colleagues from *53* countries attended the conference. Distinguished colleagues **Klaus Zimmermann** from *GLO (Germany)* & *EBES*, **Dorothea Schäfer** from *the German Institute for Economic Research (DIW Berlin, Germany),* **Cristiano Antonelli** from the *Political Economy of the University of Torino (Italy),* and **Marco Vivarelli** from *Università Cattolica del Sacro Cuore (Italy)* joined the conference as invited keynote speakers.

In addition to publication opportunities in EBES journals (*Eurasian Business Review* and *Eurasian Economic Review*, which are also published by Springer), conference participants were given the opportunity to submit their full papers for this issue. Theoretical and empirical papers in the series cover diverse areas of business, economics, and finance from many different countries, providing a valuable opportunity to researchers, professionals, and students to catch up with the most recent studies in a diverse set of fields across many countries and regions.

The aim of the EBES conferences is to bring together scientists from business, finance, and economics fields, attract original research papers, and provide them with publication opportunities. Each issue of *the Eurasian Studies in Business and Economics* covers a wide variety of topics from business and economics and provides empirical results from many different countries and regions that are less investigated in the existing literature. All accepted papers for the issue went through a peer-review process and benefited from the comments made during the conference as well. The current issue is entitled as "Eurasian Business and Economics Perspectives" and covers fields such as management, SMEs, economics of innovation, growth and development, investment, and monetary economics.

Although the papers in this issue may provide empirical results for a specific county or regions, we believe that the readers would have an opportunity to catch up with the most recent studies in a diverse set of fields across many countries and regions and empirical support for the existing literature. In addition, the findings from these papers could be valid for similar economies or regions.

On behalf of the series editors, volume editors, and EBES officers, I would like to thank all presenters, participants, board members, and the keynote speakers, and we are looking forward to seeing you at the upcoming EBES conferences.

Best regards,

Reykjavík, Iceland Ender Demir

Eurasia Business and Economics Society (EBES)

EBES is a scholarly association for scholars involved in the practice and study of economics, finance, and business worldwide. EBES was founded in 2008 with the purpose of not only promoting academic research in the field of business and economics but also encouraging the intellectual development of scholars. In spite of the term "Eurasia," the scope should be understood in its broadest terms as having a global emphasis.

EBES aims to bring worldwide researchers and professionals together through organizing conferences and publishing academic journals and increase economics, finance, and business knowledge through academic discussions. Any scholar or professional interested in economics, finance, and business is welcome to attend EBES conferences. Since our first conference in 2009, around *17,691* colleagues from *102* countries have joined our conferences and *9552* academic papers have been presented. **EBES has reached 3064 members from 87 countries.**

Since 2011, EBES has been publishing two journals. One of those journals, ***Eurasian Business Review***—*EABR*, is in the fields of industrial organization, innovation, and management science, and the other one, ***Eurasian Economic Review***—*EAER*, is in the fields of applied macroeconomics and finance. Both journals are published quarterly by ***Springer*** and indexed in ***Scopus***. In addition, EAER is indexed in the ***Emerging Sources Citation Index*** (*Clarivate Analytics*), and EABR is indexed in the ***Social Science Citation Index (SSCI)***. EABR's 2022 CiteScore is 5.8 (Q1) and 2022 JCR IF 2022 is 3.5. It is ranked #104/380 & Q2 in the economics category. EAER's 2022 CiteScore is 5.5 (Q1) and 2022 JCR IF 2022 is 3.4. It is ranked #105/581 & Q1 in the economics category.

Furthermore, since 2014 Springer has been publishing a new conference proceedings series (**Eurasian Studies in Business and Economics***)* which includes selected papers from the EBES conferences. The series has been recently indexed by **SCOPUS**. In addition, the 10th, 11th, 12th, 13th, 14th, 15th, 16th, 17th, 18th, 19th, 20th, 21st, 22nd, 23rd, 24th, 25th, 26th, 27th, 28th, 29th (Vol. 1), and 30th EBES Conference Proceedings have already been accepted for inclusion in the ***Conference Proceedings Citation Index—Social Science & Humanities (CPCI-SSH).*** Other conference proceedings are in progress.

On behalf of all EBES officers, I sincerely thank you for all your support in the past. We look forward to seeing you at our forthcoming conferences. We very much welcome your comments and suggestions in order to improve our future events. Our success is only possible with your valuable feedback and support!

I hope you enjoy the conference!

With my very best wishes,

Klaus F. ZIMMERMANN

President

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Part I
Eurasian Business Perspectives: Management

Measuring the Enablers of Corporate Managers' Decisions to Contribute to Non-State Social Protection



Richmond Baah, Tatjana Volkova, and Iveta Ludviga

Abstract The world is fraught with multiple crises but efforts to elicit private sector contributions to society continue to be less fruitful mainly because of two reasons. Firstly, there is limited understanding of what informs corporate managers' decision to contribute to society in crises periods. Secondly, the concepts of *'responsibility'* and *'business case'* which have framed appeals for business contribution to society have been ineffective. Even though *wisdom* is especially required for corporate decision-making in crisis periods, there is a scant literature on wisdom in corporate decision-making towards society. This research aims to assess the effects of wisdom on corporate managers' decisions towards non-state social protection in a crisis period. A survey was conducted with 1230 valid responses. Andrew Hayes's PROCESS Macro was used to conduct a mediation analysis of a serial multiple mediation model. The research finds that wisdom enables corporate managers to take decisions to contribute to non-state social protection in a crisis period. The study identifies wisdom three pathways which integrate to enable corporate managers' decisions towards societal good. The study contributes to the *Social Practice Wisdom (SPW)* theory and empirically validates the wise management decision-making model.

Keywords Decision-making · Non-state social protection · COVID-19 pandemic Social responsibility · Wisdom · Crisis period

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1 Introduction

Business plays a key role in resolving major challenges in society (Cammett & MacLean, 2014). Despite the many examples of corporate contribution to society (Mahmud et al., 2021), international policy (Rode et al., 2020) and calls from governments for private sector interventions in society (Egger et al., 2021) seem to amplify the importance of engaging the private sector to tackle global issues affecting our societies (Rode et al., 2020). So far, the concepts of *'responsibility'* (Bowen, 1953; Preston & Post, 1975) and *'business case'* (Chakravorti et al., 2014; Khan et al., 2016; Scheyvens et al., 2016) which formed the basis of such efforts have not had material effect on corporate managers' decisions to contribute positively to society.

At the same time the classical decision-making paradigms namely the *formal-empiricist paradigm* (Cohen, 1993), the *rationalist paradigm* (Bazerman & Moore, 2009), and the *naturalistic paradigm* (Cannon-Bowers & Salas, 1998) do not adequately explain corporate decision-making towards society (McMillan & Overall, 2016). Even though wisdom is especially required for corporate decision-making in crisis periods, there is a dearth of literature on wisdom in corporate decision-making (McMillan & Overall, 2016). In a world fraught with multiple crises including extreme poverty, inequality, and vulnerability (Scheidel, 2018), understanding how wisdom affects corporate managers' decisions towards society is crucial to inform steps that need to be taken to elicit more impactful corporate contributions to society.

This research aims to assess the effects of wisdom on corporate managers' decisions to contribute to non-state social protection within the COVID-19 context. Accordingly, the research addresses the question: *How does wisdom affect corporate managers' decisions towards non-state social protection within the COVID-19 context?* Unlike earlier scholarly works that measure wisdom using hypothetical situations, this study measures wisdom in a real-life context. Beyond showing the effect of wisdom on corporate manager's decisions, this study shows how the different wisdom components interact to influence the corporate manager's decision. Understanding and measuring how wisdom enables corporate decisions to contribute to non-state social protection within the COVID-19 context will provide insight on how to influence wise corporate decisions in future health crises. To the knowledge of the authors this is the first study which connects wisdom, corporate decision-making, and non-state social protection in a crisis period.

The remainder of this paper is structured as follows. The theoretical foundations section explores relevant literature to frame the research. The research conceptual framework and hypotheses are also presented in this section. In the research methodology section, the processes for obtaining and analysing data for the research as well as the relevant principles associated with such processes are explained and justified. The research results section presents the results of the methodology applied and provides conclusions on all the hypotheses that were defined for the research. In the discussion and interpretation section, the authors further elucidate the research findings by relating them to relevant literature to provide a basis for

conclusions to be made. In the conclusion and recommendation section, the key findings of the research are highlighted with recommendations on how to influence wise corporate decisions. Recommendations for further studies are also presented in this section.

2 Theoretical Foundations

The use of practical wisdom in decision-making can be traced to Aristotle, who distinguished between scientific knowledge and intelligence from the ability to make judgements and take steps that promote good life in society (Statler et al., 2007). Wisdom is seen not only as one's ability to do *"the right thing, for the right reasons, in the right way"* (Rooney, 2019, p. xv), but also in the ability to execute leadership to resolve or prevent complex problems (Yang, 2011). According to Sternberg (2008), wisdom is the short- and long-term equilibrium between personal, interpersonal, and extra-personal interests that calibrate and shape decisions and actions for a common good. Rowley and Slack (2009) summarizes wisdom into six key facets. According to them, wisdom: (a) is inherent in or demonstrated through action; (b) involves the use of knowledge with sophistication and sensitivity; (c) is demonstrated through decision-making; (d) involves the application of judgement in real-life situations; (e) requires the discernment of right and wrong using ethical and social standards; and (f) "is an interpersonal phenomenon, requiring exercise of intuition, communication, and trust" (Rowley & Slack, 2009, pp. 113–114).

Wisdom does not develop from anything. It emerges from the exigencies of everyday living—successes, challenges, failures, adaptations to stressful environments, among others (Webster, 2003). In Webster's (2003) view, wisdom can be conceptualized into five dimensions: *experience*, *emotional regulation*, *reminiscence and reflection*, *openness*, and *humour*. Generally, the older a person is, the more experienced the person is expected to be, which may lead to a tendency to associate age with wisdom. Webster (2003), however, cautions that there are relatively inconclusive findings regarding the association between age and wisdom. Accumulating general experience does not lead to wisdom. Rather, difficult and morally challenging *experiences* that require the use of in-depth knowledge or insight leads to wisdom (Webster, 2003). *Emotional regulation* refers to one's ability to recognize, embrace, and apply the full range of human affect in a nuanced, complex, and constructive manner (Webster, 2003). *Reminiscence and reflection* refer to the ability to know and constantly examine oneself. Reflecting on one's present and past provides a foundation for understanding oneself, forming and maintaining one's identity as well as solving problems, and adapting to cope within a context, which are necessary conditions for wisdom to develop (Webster, 2003). People who are not agile—rigid and inflexible—in their responses to life situations are considered unwise. *Openness* to alternative options, views, information and strategies enables a wise person to efficiently address difficult and complex

problems (Webster, 2003). According to Staudinger et al. (1997), openness to experience is a strong predictor of wisdom-related performance. A wise person enjoys and uses *humour* in different ways and contexts and for various reasons (Webster, 2003). In some cases, a person may use humour to de-escalate tensions while offering a sense of perspective on a situation (Frecknall, 1994). However, not every humour contributes to wisdom. For example, sarcasm, teasing, and caustic humour do not indicate wisdom (Webster, 2003).

The approaches to measuring wisdom can be classified into two main categories namely, the *performance measures of wisdom* and the *self-report measures of wisdom* (Fung et al., 2020; Glück, 2018). Researchers use the performance measures of wisdom to measure personal wisdom based on an analysis of a person's wisdom-related performance in a 'laboratory' setting (Fung et al., 2020). This group of wisdom measures assess wisdom as a competence—a person's ability to profer a solution to a specific problem using their in-depth knowledge and experience about the problem and its context (Glück, 2018). Popular examples of wisdom measures that fall within this category include the Berlin wisdom paradigm, and the Bremen wisdom paradigm (Glück, 2018). The second group of measures, the self-report wisdom measures, rely on self-reported survey approaches to measure wisdom (Fung et al., 2020). Popular self-reported wisdom scales include Ardelt's three-dimensional wisdom scale dimensions of wisdom (Ardelt, 2003) and the Wong and Law emotional intelligence scale (Wong & Law, 2002).

The *Berlin wisdom paradigm (BWP)* (Baltes & Smith, 1990; Baltes & Staudinger, 2000) operationalizes wisdom as expert knowledge (Glück, 2018). The BWP assesses personal wisdom based on how a person thinks aloud about (i.e. tells what s/he could do to solve) a hypothetical problem (Glück, 2018). Responses provided by a person whose wisdom is being assessed are rated by experts using five criteria: (1) the person's factual knowledge about the problem at hand; (2) the person's knowledge about approaches to deal with the problem; (3) the person's knowledge about the context in which the problem is situated; (4) the person's awareness and recognition of different interest, beliefs, and values that frame the problem; and (5) the person's ability to recognize and factor uncertainties in his/her solution (Glück, 2018). The *Bremen wisdom paradigm (BrWP)* developed by Mickler and Staudinger (2008), is another performance measure of personal wisdom (Glück, 2018). Like the BWP, the Bremen wisdom paradigm assesses wisdom by presenting a hypothetical situation to participants and asking them to think aloud about their behaviour in dealing with the specific situation (Glück, 2018). The BrWP assesses personal wisdom based on the following criteria: (1) *self-knowledge*—the participant's in-depth knowledge or awareness about himself or herself, including his/her strengths, weaknesses, interest, and values; (2) *heuristics of growth and self-regulation*—the person's knowledge of approaches to deal with the situation or problem positively; (3) *self-relativism*—the person's ability to reflect on and evaluate himself/herself and balance it with his/her self-esteem; (4) *interrelating self*—the person's awareness of his/her context and social environment; and (5) *tolerance of ambiguity*—the person's awareness of uncertainties and situations/factors beyond his/her control, and the ability to factor these in behaviour (Glück, 2018).

In a critique of the Berlin wisdom paradigm, Ardelt (2003) argued that what drives wisdom is not knowledge but personality. Even though a wise person should have the knowledge, a person's personality attributes which allow him/her to gain experience-based insights is at the core of wisdom (Glück, 2018). Ardelt (2003) defined wisdom as comprising three personality dimensions—*cognitive dimension, affective dimension, and reflective dimension*. Ardelt (2003) developed the *three-dimensional wisdom scale (3D-WS)* with 14 questions to measure the cognitive dimension, 13 questions to measure the affective dimension, and 12 questions to measure the reflective dimension. The *cognitive* dimension involves a person's desire for and ability to use understanding and knowledge. The *affective* dimension involves the person's values and emotions, including love or care for others. The *reflective* dimension refers to a person's ability to consider different perspectives and competing interests in his/her actions or behaviours (Ardelt, 2003). Since every leader or manager will have some form of knowledge, and what drives wisdom is not knowledge but personality (Ardelt, 2003), Wong and Law (2002) developed a scale that focuses mainly on emotional intelligence. Wong and Law (2002) adopted Mayer and Salovey's (1997) definition of emotional intelligence—*"the ability to perceive accurately, appraise, and express emotion; the ability to access and/or generate feelings when they facilitate thought; the ability to understand emotion and emotional knowledge; and the ability to regulate emotions to promote emotional and intellectual growth"* (Mayer & Salovey, 1997, p. 10). The *Wong and Law Emotional Intelligence Scale (WLEIS)* assesses wisdom based on a person's *self-emotional appraisal*, *others' emotional appraisal, use of emotions*, and *regulation of emotions* (Wong & Law, 2002). *Self-emotional appraisal* refers to a person's deep understanding of his/her emotions and his/her ability to express them naturally. *Others' emotional appraisal* refers to a person's ability to perceive and understand the emotions of the people in his/her environment. *Regulation of emotion* relates to a person's ability to control his/her emotions and the ability to recover rapidly from psychological distress. *Use of emotions* relates to a person's ability to constructively use his/her emotional to enhance his/her personal performance (Mayer & Salovey, 1997; Wong & Law, 2002). The WLEIS contains a total of 16 items—four for each dimension of emotional intelligence—to measure wisdom.

This research operationalizes the *wise management decision-making model* (Intezari & Pauleen, 2019) to develop the research conceptual framework depicted in Fig. 1. According to Intezari and Pauleen (2019), management decisions in the real world can be guided and shaped by wisdom principles, and that making wise decisions involves a multi-faceted process and the careful consideration of different interconnected variables. Decision-making in the real world does not follow a set of pre-defined sequential actions, but it is *"non-sequential and non-linear"* (Intezari & Pauleen, 2019, p. 165). They operationalize the concept of wise management decision-making as "*an integrated cogni-emotional, reflective process that accounts for internal and external conditions related to the decision, which is made with the well-being of the greatest number of stakeholders in mind"* (Intezari & Pauleen, 2019). The model of wise management decision-making uses four dimensions of wisdom to explain management decision-making, namely: *multi-perspective*

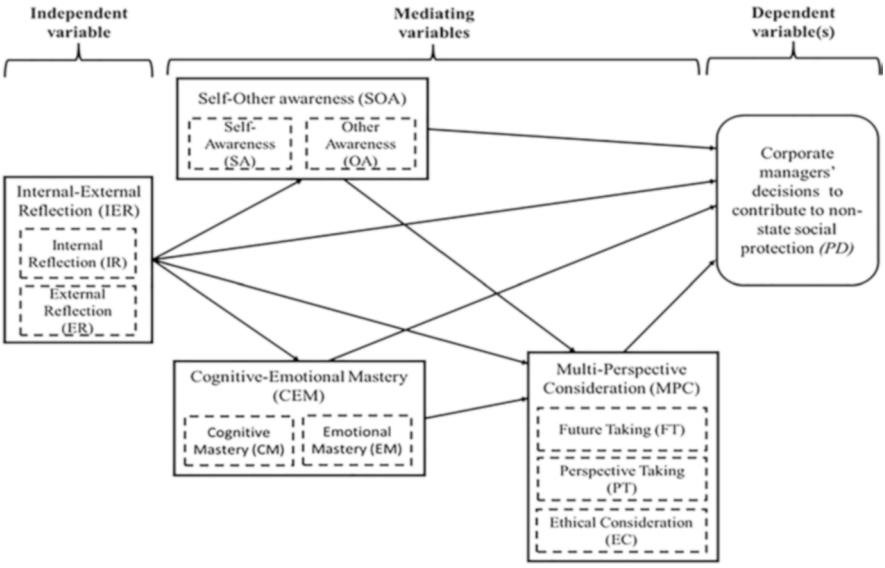


Fig. 1 Research conceptual framework. Source: Developed by authors

considerations, *self-other awareness*, *emotional-cognitive mastery*; and *internal-external reflection* (Intezari & Pauleen, 2019). Wise decision-makers integrate all four dimensions in their decision-making (Intezari & Pauleen, 2018; Intezari & Pauleen, 2019). The model was developed through a Grounded theory approach (Intezari, 2013; Intezari & Pauleen, 2019). Further the four dimensions of the model are discussed.

Multi-perspective consideration (MPC) refers to the extent to which decision makers consider the short-term and long-term results and consequences, the interests and values of stakeholders, and the ethical implications of their decision. Three principles of wisdom underpin *MPC*, namely: *future thinking*, *perspective taking*, and *ethical consideration* (Intezari & Pauleen, 2019). Having a vision of the future is at the core of strategic management. Hence, wise decision-makers assess the short- and long-term consequences of their decisions. This is referred to as *future thinking* (Intezari & Pauleen, 2019). In addition, wise decision makers need to understand the expectations, interests, and values of those involved in or affected by the decision. Giving due consideration to different stakeholder' interests is referred to as *perspective-taking* (Intezari & Pauleen, 2019). *Ethical consideration* is an essential wisdom principle in decision-making. This involves assessing the ethical implications of the decision and ensuring that it is in the best interest of those affected by it or leads to a common good (Intezari & Pauleen, 2019). This research defines Multi-Perspective Consideration as the corporate manager's *consideration of the interests and values of relevant stakeholders in evaluating possible short- and long-term solutions for the problem situation underpinned largely by shared value principle and not necessarily defined by past or current profitability levels.* Decision

makers' *MPC* depends on their awareness of themselves and others, and how they manage their cognition and emotions (Intezari & Pauleen, 2019).

Self-other awareness (SOA) refers how decision makers' awareness of their internal world *(self-awareness)* and external world *(other awareness)* affect their decisions for a common good (Intezari & Pauleen, 2019). Decision makers' internal world includes, among others, their knowledge, strengths and weaknesses, and personal values and preferences (Intezari & Pauleen, 2019). Their external world refers to the decision makers' awareness of decision situation or environment. This includes the decision makers' awareness of the nature of problem, and the factors affecting the situation (Intezari & Pauleen, 2019). In this research, self-other awareness refers *to corporate managers' (non)knowledge about the conditions in the problem situation (i.e., the COVID-19 context) and their empathy towards vulnerabilities in society and/or actors affected by the problem context*. Self-other awareness includes the corporate manager's knowledge of his/her (non)knowledge about his/her problem environment as well as his/her personal philosophy or value systems which may inform his/his actions in that environment. Matthews (1998) argues that: *"a wise person weighs the knowns and the unknowns, resists overwhelming emotion while maintaining interest, and carefully chooses when and where to take action"* (Matthews, 1998, p. 211). Accordingly, the extent to which the decision maker integrates their cognition and emotions in the decision-making process is referred to as *cognitive-emotional mastery (CEM)*. Two wisdom principles underpin *CEM*—the decision maker's *cognitive mastery* and *emotional mastery* (Intezari & Pauleen, 2019). Combining these principles means that the decision maker applies both rationality and non-rationality in the decision-making process (Intezari & Pauleen, 2019). In this research, cognitive-emotional mastery is defined as *the integration of the corporate manager's (non)knowledge about the actual and/or potential impact of the problem situation on his/her company and his/her emotion suitable for the decision context.*

Decision makers also consider internal factors (Browne, 2015) and the decision environment—external factors (Simon, 1960) when making decisions. These are the principles that underly Intezari and Pauleen's (2019) *internal-external reflection (IER)* wisdom category. Here, the decision maker (re)assesses facts and assumptions to understand the decision environment and considers his or her organization's capabilities and goals. Internal-External Reflection, according to Intezari (2013), refers to *reflexivity*—a combination of internal reflection and external reflection in a way that is more than simply being reflective (Intezari, 2013). Reflexivity is the ability to locate oneself in a situation, to appreciate how one's own self affects the situation (Fook, 2002). This research follows Intezari (2013) and Fook (2002) to define internal-external reflection as *the corporate manager's ability to situate himself or herself in the problem context (i.e. the COVID-19 context) by recognizing his/her vulnerabilities and society's limited capacity to address the problem as well as the possible trajectories within the context*.

Through a Grounded theory approach, Intezari and Pauleen's (2019) explained the relationships between the four categories of the wise management decision-making model as follows. The decision maker's internal-external reflection (*IER)*

influences his/her self-other awareness *(SOA)* and cognitive-emotional mastery *(CEM)*, which in turn inform their multi-perspective consideration *(MPC)* when making decisions in a state of uncertainty. In addition, the decision maker's internal-external reflection (*IER)* directly influences his multi-perspective consideration *(MPC)* to affect the decision made. Based on these relationships and the research conceptual model depicted in Fig. 1, the authors posit the following nine hypotheses for testing in this research.

***H*$_1$:** *A corporate manager's internal-external reflection (IER$_1$) directly influences his/her decision to contribute to non-state social protection (PD).*

***H*$_2$:** *A corporate manager's self-other awareness (SOA$_1$) directly influences his/her decision to contribute to non-state social protection (PD).*

***H*$_3$:** *A corporate manager's cognitive-emotional mastery (CEM$_1$) directly influences his/her decision to contribute to non-state social protection (PD).*

***H*$_4$:** *A corporate manager's multi-perspective consideration (MPC$_1$) directly influences his/her decision to contribute to non-state social protection (PD).*

***H*$_5$:** *A corporate manager's self-other awareness (SOA$_1$) mediates the effect of his/her internal-external reflection (IER$_1$) on his/her decision to contribute to non-state social protection (PD).*

***H*$_6$:** *A corporate manager's cognitive-emotional mastery (CEM$_1$) mediates the effect of his/her internal-external reflection (IER$_1$) on his/her decision to contribute to non-state social protection (PD).*

***H*$_7$:** *A corporate manager's multi-perspective consideration (MPC$_1$) mediates the effect of his/her internal-external reflection (IER$_1$) on his/her decision to contribute to non-state social protection (PD).*

***H*$_8$:** *A corporate manager's self-other awareness (SOA$_1$) and multi-perspective consideration (MPC$_1$) serially mediate the effect of his/her internal-external reflection (IER$_1$) on his/her decision to contribute to non-state social protection (PD).*

***H*$_9$:** *A corporate manager's cognitive-emotional mastery (CEM$_1$) and multi-perspective consideration (MPC$_1$) serially mediate the effect of his/her internal-external reflection (IER$_1$) on his/her decision to contribute to non-state social protection (PD).*

3 Research Methodology

3.1 Survey Development and Data Collection

While the wisdom scales explained in Sect. 2 measure wisdom in different aspects, none of them when considered individually, will fully suffice for measuring wisdom in management decision-making in a period of uncertainty, such as the COVID-19 context. Therefore, the authors developed a scale and conducted a survey using the scale developed. The purpose of the scale is to measure wisdom in management decision-making towards non-state social protection within the COVID-19 context

using the wise management decision-making model as a framework. The author developed a self-report wisdom scale based on semi-structured interviews, existing literature, and by adapting relevant items from Ardelt's (2003) 3D-WS and Wong and Law's (2002) WLEIS. The Bremen Wisdom Paradigm also inspired the development of this scale. Through purposive sampling, the authors video interviewed three chief executive officers (CEOs) who contributed to non-state social protection in Ghana. The interviews helped to contextualize the scale for African countries where non-state social protection is predominant. Most people in Ghana and Kenya rely mainly on non-state social protection (Awortwi & Walter-Drop, 2018; Cammett & MacLean, 2014; Kansiime et al., 2021).

It is essential to underline that "wisdom manifests itself clearly in specific, rare situations" (Glück, 2018, p. 1399). The specific crisis in a particular setting may amplify how wise or less wise an individual is (Glück & Bluck, 2014). Contextualizing survey items based on interviews with those taking decisions to contribute to non-state social protection within the COVID-19 crisis in Ghana contributed to *ecological validity* of the scale. Ecological validity refers to the extent by which a research setting approximates the real-world situation that it relates to (Glück, 2018). Both 3D-WS and WLEIS are among established scales in wisdom research (Glück, 2018). Two academic experts reviewed the draft survey questionnaire for *content validity*. Content validity refers to the extent to which the items in a measure represent the respective content domain (Glück, 2018). According to Glück (2018), the definition of a construct is usually the starting point for researchers when developing a self-report wisdom scale. Therefore, to facilitate the experts' review, the author added the explanatory model, the definitions of the variables (i.e., the wisdom principles), and the conceptual model presented in the literature review section to the draft questionnaire that was sent to the experts. The survey questionnaire was modified based on the experts' comments. Afterwards the questionnaire was sent to a potential respondent—a business expert and senior manager of a bank in Ghana—to review for any errors and potential ambiguities. This expert provided comments regarding his perceived ambiguities relevant to the draft questionnaire. The business expert's comments also contributed to the *ecological validity* of the survey questionnaire.

The authors considered the possibility for *common method bias* because all the variables in the conceptual model are measured using the same survey and the subject matter of the research may be perceived as having a socially desirable end (Kock et al., 2021). The authors applied *psychological separation* in the survey design as an *ex-ante control* to address potential common method bias or common method variance. Common method variance refers to a systematic error variance resulting from a common method used to measure the constructs of a research (Kock et al., 2021). The control applied are as follows: (a) the survey items were developed at the wisdom principle level (e.g. internal reflection, self-awareness, etc.) and there was no indication to respondents of how these components will be combined into the wisdom dimensions (i.e. IER, SOA, CEM, and MPC); (b) while the survey items for the antecedent (independent and mediating) variables were measured using an ordinal scale, the

dependent variable was measured on a binary scale; and (c) the survey item measuring the dependent variable did not directly follow those measuring the antecedent variables. Webropol was used for the survey which was sent to 1382 potential respondents in Kenya.

The survey was administered in Kenya because non-state social protection is the predominant form of social protection in the country (Awortwi & Walter-Drop, 2018; Cammett & MacLean, 2014). In addition, Kenya suffered significantly adverse consequences of the COVID-19 pandemic due to their large informal sectors, reinforcing the need for stronger social protection and the expectation for private sector intervention (Egger et al., 2021). The first COVID-19 case in East Africa Region was recorded in Kenya on 13 March 2020 (Kansiime et al., 2021), and as at 30 June 2020, the country had recorded 6366 confirmed cases with 2039 recoveries and 148 deaths (Kansiime et al., 2021). In Kenya, the combined effect of COVID-related restrictions impacted all stages of supply chains and disrupted domestic and regional markets. These led to significant losses of income for people working in the informal sector who constitute most of the working population and serious food security issues, and many people were pushed into extreme poverty (Kansiime et al., 2021). Kenya's overall population is more than 47.5 million. Of this population, females constitute 50.49% while males constitute 49.51% (KNBS, 2019). The country has a youthful population because 76.66% of the country's population is aged 35 years or below. This comprises 41.50% aged 0–15 years, 19.93% aged 16–25 years, and 15.23% aged 26–35 years (KNBS, 2019). Those aged 36 years and above constitute 23.34% of the total population. This comprises 9.80% aged 36–45 years, 5.92% aged 46–55 years, 4.06% aged 56–65 years, and 3.56% who are 66 years old or above (KNBS, 2019).

3.2 Data on Respondents

The authors conducted the survey in Kenya in 2021 using Webropol. A total of 1382 potential respondents received the survey. Of this number, 1266 responded to the survey (response rate of 89%) and there were 1230 valid responses. Of the valid responses, 752 (61.14%) were provided by females while 465 (37.80%) were provided by males. Two (0.16%) respondents belong to other gender groups while 11 (0.90%) respondents did not disclose their gender identity.

Majority (81.22%) of the respondents work in three sectors—the health sector, the technology sector, and the telecommunication sector. There were 350 (28.45%) respondents from the health sector, 298 (24.23%) from the technology sector, and 351 (28.54%) from the telecommunication sector. Respondents from the agriculture, advertising, consumer goods, entertainment, financial services, infrastructure, mining, oil and gas, professional services, technology, telecommunication, media, and other sectors together constitute 18.78% of the total respondents to the survey. Descriptive statistics by age group are presented in Table 1.

Table 1 Descriptive statistics by age groups

Past Decision to contribute to non-state social protection?	16–25 years	26–35 years	36–45 years	46–55 years	56–65 years	66+ years	Total
Yes	413	68	677	2	0	0	1160
No	58	12	0	0	0	0	70
Total	471	80	677	2	0	0	1230
Percent	38.29	6.51	55.04	0.16	0	0	100

The authors performed Mann-Whitney *U* test to evaluate whether gender related difference exist for each wisdom dimension. The test results show that except for corporate managers' cognitive-emotional mastery, gender related differences in the wisdom dimensions are statistically significant. The results show that:

(a) significant differences exist in corporate managers' internal-external reflection between females (Median = 32, N = 752) and all other gender identities (Median = 36, N = 478), U = 54,368, z = 21.3084, p = 0.000, r = 0.608.
(b) significant differences exist in corporate managers' self-other awareness between females (Median = 36, N = 752) and all other gender identities (Median = 44, N = 478), U = 44,370, z = 22.9109, p = 0.000, r = 0.653.
(c) differences in corporate managers' cognitive-emotional mastery between females (Median = 32, N = 752) and all other gender identities (Median = 29, N = 478), are not statistically significant U = 178624.5, z = 0.1875, p = 0.851, r = 0.005.
(d) significant differences exist in corporate managers' multi-perspective consideration between females (Median = 47, N = 752) and all other gender identities (Median = 50, N = 478), U = 64,644, z = 19.4752, p = 0.000, r = 0.555.

The effect size (r) is calculated as $r = z / \sqrt{N}$, where z is the Z statistic and N is the total number of cases. Generally, the rule of thumb for effect size (r) is as follows: r = 0.1 reflects small effect, r = 0.3 reflects medium effect, and r = 0.5 = large effect (Cohen, 1988).

The results of Friedman's test on the wisdom dimensions χ^2 (df = 3, N = 1230) = 3428.366, $p = 0.000$ shows that significant differences exist between the corporate managers' scores in the wisdom dimensions. The authors compared the means of the wisdom dimensions by performing a Wilcoxon Rank Sum test with Bonferroni correction ($\alpha = 0.05/6 = 0.0083$) to avoid Type I errors (Lin et al., 2021). The results of the six comparisons presented in Table 2 show that difference between each pair of means is significant. The corporate managers scored highest in multi-perspective consideration ($M = 47.86$, $SD = 5.23$), followed by self-other awareness ($M = 37.63$, $SD = 5.27$), and internal-external reflection ($M = 31.64$, $SD = 4.57$). They scored the lowest scores in cognitive-emotional mastery ($M = 28.23$, $SD = 5.29$).

Further analysis was performed to ascertain the comparative strengths of the wisdom sub-components. The results of Friedman test χ^2 (df = 8, N = 1230) = 6211.135, p = 0.000 shows that significant differences exist between the corporate managers' mean scores in the sub-components of the wisdom

Table 2 Results of Wilcoxon Sign Ranks test on wisdom dimensions

Wisdom dimensions	SOA—IER	CEM—IER	MPC—IER	CEM—SOA	MPC—SOA	MPC—CEM
Z	−30.136[a]	−21.509[b]	−30.588[a]	−30.196[b]	−30.906[a]	−30.577[a]
Asymp. Sig. (2-tailed)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

[a]Based on negative ranks
[b]Based on positive ranks

Table 3 Descriptive statistics on wisdom sub-components

Wisdom component	Wisdom sub-components	N	Mean	Std. Deviation	Min.	Max.
IER	Internal Reflection (IR)	1230	16.49	2.577	4	20
	External Reflection (ER)	1230	15.15	2.455	4	20
SOA	Self-Awareness (SA)	1230	20.36	3.954	5	25
	Other Awareness (OA)	1230	17.27	1.918	4	20
CEM	Cognitive Mastery (CM)	1230	13.36	3.287	5	20
	Emotional Mastery (EM)	1230	14.87	2.452	4	20
MPC	Future Taking (FT)	1230	13.49	2.091	3	15
	Perspective Taking (PT)	1230	15.15	2.262	5	20
	Ethical Consideration (EC)	1230	19.23	2.856	5	25

dimensions presented in Table 3. Comparison of the wisdom sub-components was done by performing a Wilcoxon test with Holm-Bonferroni correction to avoid Type I errors in multiple comparisons (Arzanforoosh et al., 2021). A total of 36 comparisons were done and the results show that the difference between each pair of means is significant.

The strongest wisdom sub-component is the corporate managers' self-awareness (M = 20.36, SD = 3.954) while the weakest wisdom sub-component is the corporate managers' cognitive mastery (M = 13.36, SD = 3.287).

3.3 Data Reliability

Based on the results of Cronbach's alpha calculation, which are summarized in Table 4, all scales are considered reliable. Traditionally, a construct is considered reliable if the Cronbach's alpha (α) value is higher than 0.70 (Hair et al., 2017).

The results of the Harman's EFA test, as an *ex-post statistical control* (Kock et al., 2021), on the survey data including all the measured items and the dependent variable, shows that one factor accounts for 35.21% of the variances in the measurement items. The authors, therefore, conclude that common method bias is not present. Common method bias is present if Harman's EFA test with all the measure items in the survey shows that one factor explains more than 50% of the variances in the measurement items (Fuller et al., 2016; Kock et al., 2021; Podsakoff et al., 2003).

Table 4 Reliability statistics on the antecedent (independent and mediating) variables

Variable	Number of items	Alpha (α)
Internal-external reflection	8	0.802
Self-other awareness	9	0.858
Cognitive-emotional mastery	8	0.775
Multi-perspective considerations	12	0.791

Table 5 Pearson correlation matrix

Variables	IER_1	SOA_1	CEM_1	MPC_1
Internal-external reflection	–			
Self-other awareness	0.817**	–		
Cognitive-emotional mastery	0.643**	0.521**	–	
Multi-perspective consideration	0.645**	0.710**	0.650**	–

**Correlation is significant at the 0.01 level (2-tailed)

As presented in Table 5, there is no strong correlation between the antecedent variables (i.e., $r < 0.7$) in most cases except for the correlations between IER_1 and SOA_1 ($r = 0.817$), and between MPC_1 and SOA_1 ($r = 0.710$) which are significant. These strong correlations are not problematic because of the theoretical relationship between the variables as explained in the wise management decision-making model.

Due to the strong correlation between some of the variables, the authors assessed whether multicollinearity is present. Multicollinearity is present if an antecedent variable's Tolerance value is <0.1 or VIF is >10 (Pallant, 2020). The results of the collinearity assessment presented in Table 6 shows that multicollinearity is not present in the data.

3.4 Data Analysis

A serial multiple mediator model (Hayes, 2022) was developed based on the wise management decision-model to evaluate the effects of wisdom on corporate managers' decisions to contribute to non-state social protection within the COVID-19 context. The author analysed the data using the Statistical Package for Social Sciences (SPSS) version 28 running Model 80 of the PROCESS Macro version 4.1 (Hayes, 2022). The author performed mediation analysis using logistic regression because the dependent variable is dichotomous (Hayes, 2022; Iacobucci, 2012). Mediation analysis is a popular statistical approach used by behavioural scholars to test hypothetical paths in which an independent variable, *X*, might transmit its effect on a dependent variable, *Y*, through a mediating variable, *M* (Gramszlo et al., 2018; Hayes, 2022; Iacobucci, 2012). Mediation models become more complex when more than one mediator which are parallel or in series are used in the model. Many studies have been conducted using multiple mediation models (Hayes, 2022). Examples of such studies include Aragón et al. (2015), Brown-Iannuzzi et al.

Table 6 Collinearity statistics

Variables	Tolerance	VIF
Internal-external reflection	0.268	3.738
Self-other awareness	0.263	3.801
Cognitive-emotional mastery	0.470	2.127
Multi-perspective consideration	0.387	2.585

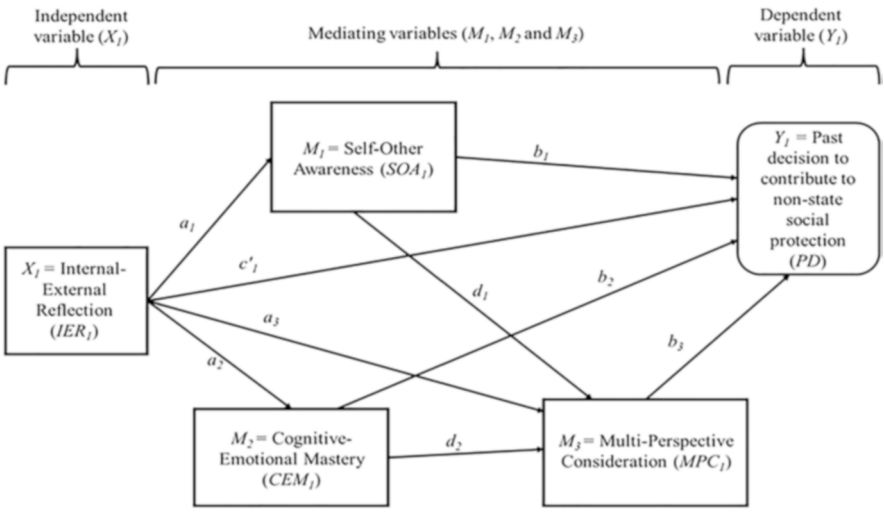


Fig. 2 Serial multiple mediator statistical model for corporate managers' decisions to contribute to non-state social protection within the COVID-19 context. Source: Developed by authors

(2017), Gramszlo et al. (2018), and Knobloch-Westerwick and Hoplamazian (2012). The dependent variable in this research, corporate managers' decision to contribute to non-state social protection (PD), is binary. Coding of the dependent variable is as follows: *Yes* = 1, and *No* = 0.

The statistical model estimated is presented in Fig. 2. In the serial multiple mediator model depicted in Fig. 2, there are two parallel mediators, M_1 = self-other awareness (SOA_1), M_2 = cognitive-emotional mastery (CEM_1), and one mediator, M_3 = multi-perspective consideration (MPC_1), in series to the first two mediators. The labels on the arrows between the variables denote the regression coefficients or regression slopes for each antecedent variable in the model (Gramszlo et al., 2018; Hayes, 2022). The regression coefficients measuring the direct effect of the independent variable, X_1, on the mediating variables M_1, M_2, and M_3 are denoted by a_1, a_2, and a_3, respectively. The regression coefficients measuring the direct effects of the mediating variables M_1, M_2, and M_3 on the dependent variable, Y_1, are denoted by b_1, b_2, and b_3, respectively. The regression coefficients measuring the effect of the parallel mediators, M_1, and M_2, on the serial mediator, M_3, are denoted by d_1 and d_2, respectively. The direct effect of the dependent variable, X_1, on the dependent

variable, Y_1, without passing through any mediator is denoted by c'_1 (Gramszlo et al., 2018; Hayes, 2022).

The indirect effects of the independent variable on the dependent variable in the statistical model are: (1) $IER_1 \rightarrow SOA_1 \rightarrow PD$ measured by a_1b_1; (2) $IER_1 \rightarrow CEM_1 \rightarrow PD$ measured by a_2b_2; (3) $IER_1 \rightarrow MPC_1 \rightarrow PD$ measured by a_3b_3; (4) $IER_1 \rightarrow SOA_1 \rightarrow MPC_1 \rightarrow PD$ measured by $a_1d_1b_3$; and (5) $IER_1 \rightarrow CEM_1 \rightarrow MPC_1 \rightarrow PD$ measured by $a_2d_2b_3$.

4 Research Results

When PROCESS is used in SPSS to estimate the dichotomous dependent variable, Y_1, using logistic regression, the regression coefficients of the model Y_1 are expressed on a log-odds metric. The indirect effects of X_1 on Y_1 are expressed in log-odds metrics since the effects of the mediators on Y_1 are logistic regression coefficients (Hayes, 2022). Accordingly, the indirect effects of X_1 on Y_1 are calculated as the product of the effect of X_1 on the mediator and the effect of the mediator on Y_1 controlling for X_1 as shown in Table 7. To make inferences, the log-odds can be exponentiated to obtain effects on an odd ratio metric (Hayes, 2022). The indirect effects in the serial multiple mediator statistical model in Fig. 2 were estimated in PRCOESS using 5000 bootstrapped samples and the significance of the regression coefficients was assessed at 95% bootstrapped confidence intervals (Gramszlo et al., 2018; Hayes, 2022; Iacobucci, 2012). The results of the data analysis are presented in Fig. 3, Tables 7 and 8.

Generally, the total effect, c, of the independent variable, X_1, on the dependent variable, Y_1, is the sum of the direct effect, c'_1, and the indirect effect of the independent variable, X_1, on the dependent variable, Y_1 (Hayes, 2022). The indirect effect of the independent variable, X_1, on the dependent variable, Y_1, through each hypothesised mediator, e.g., M_1, is the product of the independent variable's effect on M_1 and the effect M_1 on the dependent variable, Y_1, which is denoted by a_1b_1 (Hayes, 2022). Other indirect paths and effects are presented in Table 8. Generally, when OLS regression or SEM analysis is performed with a continuous dependent variable, the total effect of the independent variable, X_1, on the dependent variable, Y_1, is calculated as (Gramszlo et al., 2018; Hayes, 2022):

$$c = c'_1 + a_1b_1 + a_2b_2 + a_3b_3 + a_1d_1b_3 + a_2d_2b_3 \quad (1)$$

This implies that:

$$c - c_1^{'} = a_1b_1 + a_2b_2 + a_3b_3 + a_1d_1b_3 + a_2d_2b_3 \quad (2)$$

Equations (1) and (2) do not hold true when the dependent variable is dichotomous and logistic regression is performed (Hayes, 2022). This means that in the

Table 7 Path (direct effects) regression coefficients, standard errors, and model summary information

	Consequent														
		M_1 (SOA_1)				M_2 (CEM_1)				M_3 (MPC_1)				Y_1 (PD)		
Antecedent		Coeff.	SE	p		Coeff.	SE	p		Coeff.	SE	p		Coeff.	SE	p
X_1 (IER_1)	a_1	.9427	.0190	.0000	a_2	.7438	.0253	.0000	a_3	−.0789	.0393	.0447	c'_1	.0005	.0406	.9906
M_1 (SOA_1)									d_1	.5514	.0305	.0000	b_1	.2138	.0414	.0000
M_2 (CEM_1)									d_2	.4004	.0230	.0000	b_2	−.0395	.0326	.2255
M_3 (MPC_1)													b_3	−.1743	.0320	.0000
Constant		7.8014	.6077	.0000		4.6993	.8088	.0000		18.3061	.7014	.0000		4.5123	1.1546	.0001
		$R = 0.8167$, $R^2 = 0.6670$				$R = 0.6427$, $R^2 = 0.4131$				$R = 0.7830$, $R^2 = 0.6132$				χ^2 (4, $N = 1230$) = 53.5692, $p = 0.0000$		
		F (1, 1228) = 2459.8359, $p = 0.0000$				F (1, 1228) = 864.2025, $p = 0.0000$				F (3, 1226) = 647.7650, $p = 0.0000$						

Note: The regression coefficients of model Y_1 (PD) are expressed in a log-odds metric

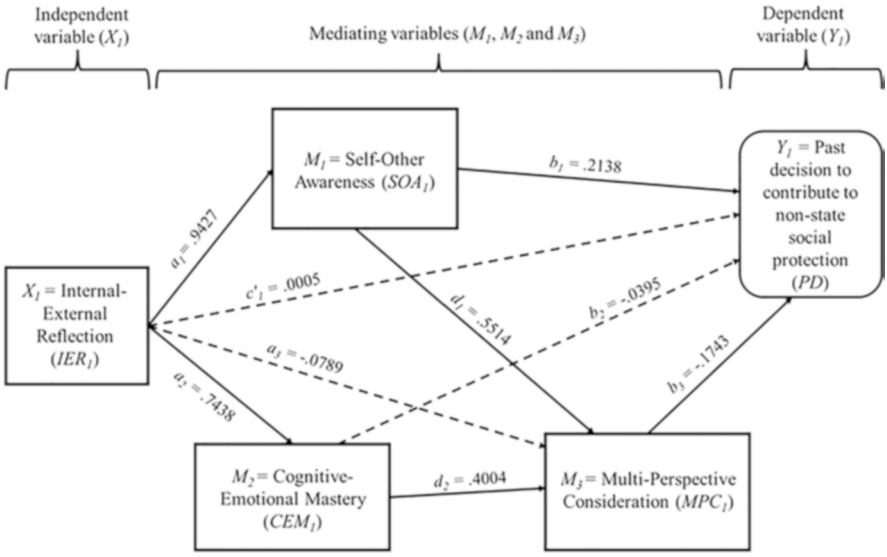


Fig. 3 Results of the serial multiple mediator statistical model for corporate managers' decisions to contribute to non-state social protection within the COVID-19 context. Solid lines represent significant associations and broken lines represent non-significant associations. Source: Developed by authors

serial multiple mediator model, which is estimated in this research using logistic regression,

$$c \neq c'_1 + a_1b_1 + a_2b_2 + a_3b_3 + a_1d_1b_3 + a_2d_2b_3 \tag{3}$$

and

$$c - c_1^{'} \neq a_1b_1 + a_2b_2 + a_3b_3 + a_1d_1b_3 + a_2d_2b_3 \tag{4}$$

The inequality in Eqs. (3) and (4) mean that the mediation results of the mediation analysis should be partitioned into direct effect and indirect effects components for analytical purposes (Hayes, 2022). Due to the bootstrapping approach used in estimating the model, "the standard use of the Hosmer–Lemeshow (HL) test, confirming a fitted linear regression model is the correct model, is not reliable because it does not distinguish between nonlinearity and noise in checking the model fit" (Ratner, 2017, p. 429). Partitioning the results of the mediation analysis into direct and indirect is suitable for this research because the focus is not on only the independent variable and the total effect it has on the dependent variable. The research seeks to ascertain the effects of and the paths among all the wisdom variables on a manager's decision to contribute to non-state social protection. Based on the results of the data analysis, the authors assessed and concluded on hypothesis 1–9 as follows.

Table 8 Summary of mediation results of the serial multiple mediator model

Independent variable (X_1)	Mediating variables (M_1, M_2, and M_3)	Dependent variable (Y_1)	Indirect path		Indirect effect (Coeff.)	Bootstrapped SE	95% Bootstrapped Confidence Interval	
							Lower Limit	Upper Limit
IER_1	SOA_1	PD	$IER_1 \rightarrow SOA_1 \rightarrow PD$	a_1b_1	.2015	.0516	.1102	.3115
IER_1	CEM_1	PD	$IER_1 \rightarrow CEM_1 \rightarrow PD$	a_2b_2	−.0294	.0328	−.0937	.0353
IER_1	MPC_1	PD	$IER_1 \rightarrow MPC_1 \rightarrow PD$	a_3b_3	.0138	.0165	−.0152	.0509
IER_1	SOA_1; MPC_1	PD	$IER_1 \rightarrow SOA_1 \rightarrow MPC_1 \rightarrow PD$	$a_1d_1b_3$	−.0906	.0288	−.1501	−.0369
IER_1	CEM_1; MPC_1	PD	$IER_1 \rightarrow CEM_1 \rightarrow MPC_1 \rightarrow PD$	$a_2d_2b_3$	−.0519	.0160	−.0836	−.0211

Based on the results of the data analysis, the direct effect of corporate managers' internal-external reflection on the decision to contribute to non-state social protection ($IER_1 \rightarrow PD$) is negative and non-significant ($c'_1 = 0.0005$, *s.e.* = 0.0406, $p = 0.9906$). This means that there is no direct relationship between managers' internal-external reflection and their decisions regarding non-state social protection within the COVID-19 context. The hypothesis, H_1, is rejected.

Based on the data analysis, the direct effect of corporate managers' self-other awareness on their decision to contribute to non-state social protection ($SOA_1 \rightarrow PD$) is positive and significant ($b_1 = 0.2138$, *s.e.* = 0.0414, $p = 0.0000$). This indicates that managers who score high on self-other awareness are more likely the ones who took decisions to contribute to non-state social protection during the COVID-19 context. The hypothesis, H_2, is accepted.

The results of the data analysis show that the direct effect of a manager's cognitive-emotional mastery on his/her past decision to contribute to non-state social protection ($CEM_1 \rightarrow PD$) is negative and non-significant ($b_2 = -0.0395$, *s.e.* = 0.0326, $p = 0.2255$). This indicates that a manager's cognitive-emotional mastery on its own does not affect his/her decision to contribute to non-state social protection. The hypothesis, H_3, is rejected.

Based on the results of the data analysis, the path (direct effect) from multi-perspective consideration to the manager's past decision to contribute to non-state social protection ($MPC_1 \rightarrow PD$) is negative and significant ($b_3 = -.1743$, *s.e.* = 0.0320, $p = 0.0000$). This indicates that managers with low on multi-perspective consideration are more likely the ones who took decisions to contribute to non-state social protection during the COVID-19 context. Therefore, the hypothesis, H_4, is accepted.

The indirect effect of internal-external reflection on a manager's past decision to contribute to non-state social protection via his/her self-other awareness ($IER_1 \rightarrow SOA_1 \rightarrow PD$) is positive and statistically significant ($a_1b_1 = 0.2015$, *s.e.* = 0.0516) at 95% bootstrapped *CI* = (0.1102, 0.3115). The hypothesis, H_5, is accepted.

Based on the results of the data analysis, the indirect effect of internal-external reflection on a manager's decision through his/her cognitive-emotional mastery ($IER_1 \rightarrow CEM_1 \rightarrow PD$) is negative and statistically non-significant ($a_2b_2 = -.0294$, *s.e.* = 0.0328) at 95% bootstrapped *CI* = (−0.0937, 0.0353). The hypothesis, H_6, is rejected.

The results of the data analysis show that the indirect effect of internal-external reflection on a manager's decision through his/her multi-perspective consideration ($IER_1 \rightarrow MPC_1 \rightarrow PD$) is positive and statistically non-significant ($a_3b_3 = 0.0138$, *s.e.* = 0.0165) at 95% bootstrapped *CI* = (−0.0152, 0.0509). The hypothesis, H_7, is rejected.

Based on the results of the data analysis, the indirect effect of a corporate manager's internal-external reflection on his/her past decision through his/her self-other awareness and multi-perspective consideration ($IER_1 \rightarrow SOA_1 \rightarrow MPC_1 \rightarrow PD$) is negative and statistically significant ($a_1d_1b_3 = -0.0906$, *s.e.* = 0.0288) at 95% bootstrapped *CI* = (−0.1501, −0.0369). The hypothesis, H_8, is accepted.

The results of the data analysis show that the indirect effect of corporate manager's internal-external reflection on his/her decision to contribute to non-state social protection through his/her cognitive-emotional mastery and multi-perspective consideration ($IER_1 \rightarrow CEM_1 \rightarrow MPC_1 \rightarrow PD$) is negative and statistically significant ($a_2 d_2 b_3 = -0.0519$, *s.e.* = 0.0160) at 95% bootstrapped *CI* = (−0.0836, −0.0211). The hypothesis, H_9, is accepted.

5 Discussion and Interpretation

5.1 The Three Wisdom Pathways

The results of the data analysis show how the dimensions of wisdom were integrated in corporate managers' decision to contribute to non-state social protection in the context COVID-19. The data shows that three wisdom pathways integrate for corporate management to take decisions to contribute to non-state social protection in the context of COVID-19. These are: (1) corporate managers' self-other awareness as a wisdom pathway between their internal-external reflection and their decision to contribute to non-state social protection ($IER_1 \rightarrow SOA_1 \rightarrow PD$); (2) corporate managers' self-other awareness and multi-perspective consideration as a wisdom pathway between their internal-external reflection and their decision to contribute to non-state social protection ($IER_1 \rightarrow SOA_1 \rightarrow MPC_1 \rightarrow PD$); and (3) corporate managers' cognitive-emotional mastery and multi-perspective consideration as a wisdom

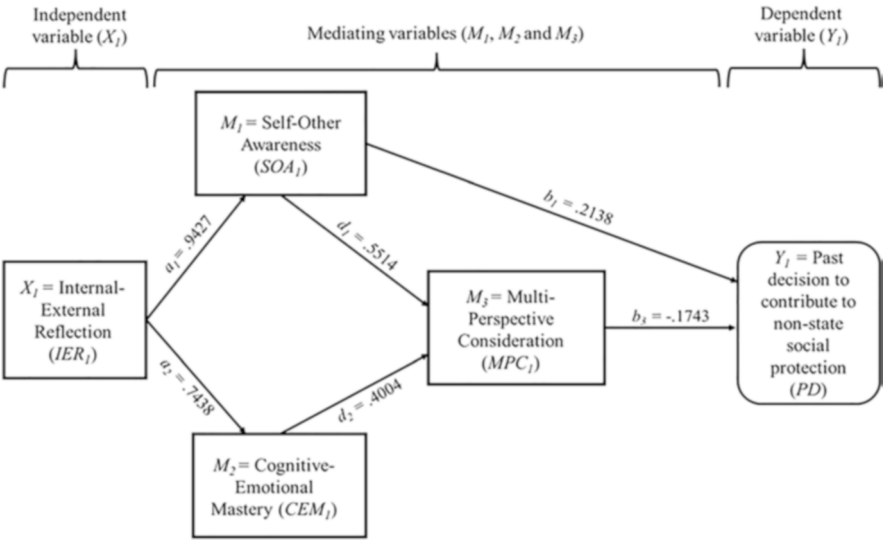


Fig. 4 Wisdom pathways for corporate managers' decisions to contribute to non-state social protection within COVID-19 Context. Source: Developed by authors

pathway between their internal-external reflection and their decision to contribute to non-state social protection ($IER_1 \rightarrow CEM_1 \rightarrow MPC_1 \rightarrow PD$). These three wisdom pathways are presented in Fig. 4 and discussed in turn.

The first wisdom pathway stipulates, that corporate managers with high internal-external reflection also have high self-other awareness, and they are more likely to decision to contribute to non-state social protection in a crisis period than those with low internal-external reflection and self-other awareness. Internal-external reflection, according to Intezari (2013), refers to *reflexivity*—a combination of internal reflection and external reflection in a way that is more than simply being reflective (Intezari, 2013). Reflexivity is the ability to locate oneself in a situation, to appreciate how one's own self affects the situation (Fook, 2002). This research follows Intezari (2013) and Fook (2002) to define internal-external reflection as *the corporate manager's ability to situate himself or herself in the problem context (i.e. the COVID-19 context) by recognizing his/her vulnerabilities and society's limited capacity to address the problem as well as the possible trajectories within the context*.

Due to the rapidly changes world, corporate managers are presented with new opportunities and dangers which were not encountered by previous generations (Elliott, 2001; Ferguson, 1997) and it takes wisdom to properly situate oneself in the context to be able to take decisions that will affect society positively. In this research, Internal-External Reflection includes the corporate manager's recognition that he/she was personally vulnerable to a possible COVID-19 infection, how deadly it was to be infected, and the fact that the country's health system did not have the capacity to deal with such infections. Of course, most countries did not have a solution at the time, so it did not matter if the corporate manager had resources to travel for healthcare elsewhere, assuming there were no limitations on movements between countries.

When corporate managers' internal-external reflection (*reflexivity*) is high, their self-others awareness increases because the essence of *reflexivity* in decision-making is for the decision maker "to achieve a deepening awareness both of the sociohistorical reality which shapes their lives and of their capacity to transform that reality" (Freire, 1970, as quoted in D'Cruz et al., 2007, p. 77). Reflexivity decreases decision-makers' self-centredness and increases their empathy for others (Bergsma & Ardelt, 2012). Self-other awareness is the integration of the decision maker's self-awareness and his/her outward awareness (Intezari, 2013). The decision maker's self-awareness refers to his/her 'internal world'—his/her "personal value system, perceptions, capacities, and abilities" (Intezari, 2013, p. 172). The decision maker's outward awareness refers to his/her awareness of the actors within his/her environment, including the state of stakeholders within that context (Intezari, 2013). Wise corporate managers have knowledge not only about themselves but also about the actors within their environment. In this research, self-other awareness refers *to corporate managers' (non)knowledge about the conditions in the problem situation (i.e., the COVID-19 context) and their empathy towards vulnerabilities in society and/or actors affected by the problem context*. Self-other awareness includes the corporate manager's knowledge of his/her (non)knowledge about his/her

problem environment as well as his/her personal philosophy or value systems which may inform his/his actions in that environment.

The data shows that when corporate managers' self-other awareness increases due to their high internal-external reflection, they are more likely to take decisions to contribute to non-state social protection in society. This direct path from self-other awareness to decision-making, without passing through multi-perspective consideration, may reflect the time pressure within which corporate managers have to take decisions in the context of a health crisis. In health crisis contexts such as the COVID-19 pandemic, where several lives are lost every passing minute, decisiveness is critical for every wise manager. Indeed, decisiveness is at the core of the *Social Practice Wisdom (SPW)* theory. At the foundation of the SPW theory is the argument that wisdom components integrate in a complex manner to produce clarity and decisiveness, enabling one to act in in the best interests of oneself, others, and the planet (Rooney, 2019).

The second wisdom pathway stipulates, that high Internal-External Reflection leads to high self-other awareness, which in turn leads to high multi-perspective consideration. And corporate managers with high multi-perspective consideration are less likely to take decisions to contribute to non-state social protection within the crisis. The path from internal-external reflection to self-other awareness has been explained as part of the first wisdom pathway. Therefore, the explanation here will focus on the remainder of the second wisdom pathway. This research defines multi-perspective consideration as the corporate manager's *consideration of the interest and values of relevant stakeholders in evaluating possible short- and long-term solutions for the problem situation underpinned largely by shared value principle and not necessarily defined by past or current profitability levels.* While wise managers consider the views and interests of others in their decision, multi-perspective consideration in this research relates more to the consideration of the perspectives of stakeholders outside of a corporate manager's organization. Implicit in the above definition is the need to: (1) collaborate with corporate with corporate managers from other organizations and other relevant actors within the problem context to ensure that decisions taken are impactful; (2) consider the short- and long-term nature of possible solutions; and (3) the belief that people, society, and the planet are more important than money.

It is important to underline that the context of a health crisis in society is different from a business crisis that a company may experience. Therefore, taking decisions to contribute to society during health crisis period means that the wise manager should consider the perspectives and interests of not only fellow managers in his/her organization, but those outside of his/her organization through a multi-sectoral collaboration to provide more impactful solutions. Even though based on the data high self-other awareness leads to high multi-perspective consideration, the data further shows that corporate managers with high multi-perspective consideration are less likely the ones who took decisions to contribute to non-state social protection during the COVID-19 context. In other words, corporate managers who collaborated less with stakeholders outside of their organization (i.e., corporate managers of other business entities, and other relevant actors)

are most likely the ones who took decisions to contribute to non-state social protection within the COVID-19 context. This reflects the traditional corporate social responsibility (CSR) approach, where companies take decisions and contribute to society in ways that allows them to have total control over their contributions (Kaplan et al., 2018). This approach does not lead to impactful contributions to society (Kaplan et al., 2018).

Due to the nature and significant impact of a health crisis on every sector of society, it is important to ensure that corporate managers' decisions towards society are sophisticated and impactful. To do this, there is a need to have a catalyst organization (Kaplan et al., 2018) through which stakeholders from different sectors can collaborate and coordinate their efforts for decisions and actions towards societal good. A good example of a catalyst organization in a crisis period is the Ghana COVID-19 Private Sector Fund which was established by the private sector in Ghana as a platform for collaborating for impactful contributions to society (Baah, 2022a; Baah, 2022b). At the initial stages of the pandemic when the Fund had not been established, many companies took individual decisions to contribute to society, which were not impactful (Baah, 2022a). However, with the establishment of the Ghana COVID-19 Private Sector Fund, a platform was created for corporate managers and stakeholders from different sectors to collaborate for decisions and actions that were more impactful (Baah, 2022a). Through this collaboration, the private sector in Ghana established, among others, the first infectious disease centre in Ghana to serve the West Africa region (Baah, 2022b).

The third wisdom pathway stipulates that high internal-external reflection leads to high cognitive-emotional mastery, which in turn leads to high multi-perspective consideration. And corporate managers with high multi-perspective consideration are less likely to take decisions to contribute to non-state social protection within the crisis. Wise corporate managers have knowledge, and they can consider their emotions in their decision-making. Practical wisdom harmonizes reason and emotion (Roca, 2007). This means that wise corporate managers consider both reason and emotion in their decisions at any given time (Intezari, 2013). This, however, should not be construed as having equal attention to reason and emotion. Rather, depending on the context, the wise corporate manager may pay more attention to reason than emotion, and vice versa (Intezari, 2013). This implies that the wise corporate manager can hone a combination of reason and emotion that best suits the decision context. In this research, cognitive-emotional mastery is defined as *the integration of the corporate manager's (non)knowledge about the actual and/or potential impact of the problem situation on his/her company and his/her emotion suitable for the decision context.* It is important to underline that the dominant *emotion* experienced by the corporate managers during the COVID-19 context was *fear* (Baah, 2022b). Therefore, cognitive-emotional mastery in this research refers the extent to which corporate managers integrate their (non)knowledge about the actual and/or potential impact of the COVID-19 pandemic on their business and their *fear*. Baah (2022b) found that in a crisis, wise corporate managers are not cowered by *fear*. Rather, the *fear* they

experience inspires them to act. That is, they leverage the *fear* for constructive use (Baah, 2022b).

The data shows that high internal-external reflection (reflexivity) leads to high cognitive-emotional mastery. This finding is reasonable because reflexivity enables one to acknowledge, articulate, and scrutinize his/her tacit knowledge (Rodwell, 1998) and to recognize and manage their emotions (D'Cruz et al., 2007). Cognitive-emotional mastery requires that corporate managers do not make rash decisions but give room for contemplation (Intezari, 2013). The need for contemplation underlines the link between cognitive-emotional mastery and multi-perspective consideration (Intezari, 2013). Accordingly, the data shows that the higher corporate manager's cognitive-emotional mastery, the higher their multi-perspective consideration. However, like the second wisdom pathway, corporate managers with high multi-perspective consideration are less likely the ones who took decisions to contribute to non-state social protection during COVID-19 crisis. In other words, collaborations between the corporate manager and multi-sectoral actors contributed less to their decisions to contribute to non-state social protection. The recommendation of a catalyst organization will still be applicable for improving the third wisdom pathway.

5.2 Comparison of the Wisdom Pathways

The ***contrast*** option of PROCESS allows for a pairwise comparison between specific indirect effects to be calculated and labelled "*C1*", "*C2*" and so forth with relevant notations to guide their explanation. PROCESS also provides the bootstrapped confidence intervals for the comparison between the specific indirect effects. The bootstrapped confidence intervals are useful for inferences about the difference (Hayes, 2022). The authors focused on a pairwise comparison between the three wisdom pathways (i.e., $IER_1 \rightarrow SOA_1 \rightarrow PD$; $IER_1 \rightarrow SOA_1 \rightarrow MPC_1 \rightarrow PD$; and $IER_1 \rightarrow CEM_1 \rightarrow MPC_1 \rightarrow PD$) as depicted in Fig. 4. The results of the comparison are presented in Table 9 and explained in turn. The results show that the differences between the three indirect effects are statistically significant since all bootstrapped confidence intervals in the PROCESS output do not contain zero.

The results shows that the odds that corporate managers whose internal-external reflection was channelled through only their self-other awareness for decisions to

Table 9 Comparison of significant indirect effects

Comparison of indirect effect	Effect (Coeff.)	Bootstrapped SE	95% Bootstrapped Confidence Interval	
			Lower Limit	Upper Limit
$a_1b_1 - a_1d_1b_3$	.2921	.0674	.1639	.4326
$a_1b_1 - a_2d_2b_3$	.2535	.0594	.1427	.3768
$a_1d_1b_3 - a_2d_2b_3$	−.0387	.0161	−.0743	−.0113

contribute to non-state social protection is greater than those whose internal-external reflection was channelled through two wisdom variables (i.e., either through self-other awareness and multi-perspective consideration serially, or through cognitive-emotional mastery and multi-perspective consideration serially). This means that the *first wisdom pathway* had the highest effect on corporate managers' decisions to contribute to non-state social protection during the COVID-19 crisis compared to the other two wisdom pathways. It also means that multi-sectoral collaboration played a limited role in decisions taken by corporate managers to contribute to non-state social protection during the COVID-19 crisis.

6 Conclusion and Recommendation

The authors draw the following conclusions based on the results of the study conducted.

This study has shown that there are *three wisdom pathways* for corporate managers' decision-making towards societal good within a global health crisis. The *first wisdom pathway* stipulates, that corporate managers with high internal-external reflection also have high self-other awareness, and they are more likely to take decisions to contribute to non-state social protection in a crisis period than those with low internal-external reflection and self-other awareness. The *second wisdom pathway* stipulates, that corporate managers' high internal-external reflection leads to their high self-other awareness, which in turn leads to their high multi-perspective consideration. And corporate managers with high multi-perspective consideration are less likely to take decisions to contribute to non-state social protection during the crisis. The *third wisdom pathway* stipulates that high internal-external reflection leads to high cognitive-emotional mastery, which in turn leads to high multi-perspective consideration. And corporate managers with high multi-perspective consideration are less likely to take decisions to contribute to non-state social protection during the crisis. These three wisdom pathways integrate to inform the decisions of wise corporate managers.

The study shows that the corporate managers demonstrated ***decisiveness*** during the crisis period because the first wisdom pathway has the strongest effect on their decisions to contribute to non-state social protection compared to the other wisdom pathways.

The starting point for corporate managers' good decisions towards society is their internal-external reflection. Given the positive relationship between corporate managers' internal-external reflection and both their self-other awareness and cognitive-emotional mastery, influencing the corporate manager's internal-external reflection is a key to triggering a wise decision-making process.

In a crisis period, wise corporate managers may take good decisions, impactful good decisions, or both, depending on the context. In a crisis period where several lives are lost every day, corporate managers with good intentions are likely, by default, to take good decisions because: (a) they need to be decisive due to time

pressure to provide solutions; and (b) of the dominant CSR mindset where each corporate entity wants to have control over its contributions to society for any potential future economic or reputational benefit to accrue directly to the entity. Where a platform exits for corporate managers from different entities to collaborate, i.e., where a catalyst organization exists, corporate managers take good decisions and/or impactful good decisions.

The authors recommend that further studies to focus on the effect of wisdom on the magnitude or value of contributions made by corporate entities to society within a crisis period. The authors further recommend that Universities should encourage and support more environmental, social, governance (ESG) research, paying particular attention to the 'social' component of ESG.

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A Planning and Control Process for Sustainable Crop Production



Chun Meng Tang and Lee Yen Chaw

Abstract This study contends that before examining the future state of crop supply and demand, it is necessary to learn from historical crop production trends in order to better understand how crop supply has met demand in the past. This study analysed 30 years of past crop production data from the Food and Agriculture Organization (FAO) of the United Nations. The analyses concentrated on the harvested area and production of five major crop categories for the years 1990 to 2020 in five continents worldwide. The findings show that overall production of cereals, fruits, pulses, roots and tubers, and vegetables worldwide have been trending upwards since 1990. However, the findings are mixed on whether crop production will be sufficient to meet demand in 2050. This study also proposes devising a crop production planning and control process based on the sales and operations planning (S&OP) process in supply chain management to help maintain a balance between crop supply and demand. This study suggests that achieving the target of zero hunger as visualised by the UN's Sustainable Development Goal No. 2 requires a concerted effort by the relevant stakeholders in the global crop supply chain to closely collaborate in an international crop production planning and control process.

Keywords Crop production · Food security · Production planning and control · Production trends · Sales and operations planning · Supply chain management

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1 Introduction

The United Nations estimates that the world's population will reach 9.7 billion in 2050, an increase of about 26% from 7.7 billion in 2019 (UN, 2019). There has been a growing concern about whether there would be sufficient food to feed everyone on the planet by then (Alexandratos & Bruinsma, 2012; Fischer et al., 2014; Tilman et al., 2011). To put food on the table, besides fishing and hunting, humans depend heavily on a wide range of farming activities, from crops and livestock to seafood (Béné et al., 2015; Breeman et al., 2015). One of the United Nations' Sustainable Development Goals (SDGs) is zero hunger. It is estimated that 840 million people will suffer from hunger by 2030 if the world does not act together to correct the situation (UN, 2015). To achieve the goal, sustainable and productive agricultural production systems are essential to produce enough food for everyone (Geyik et al., 2020; UN, 2015).

Increasing concern over food security has prompted the United Nations to launch a global initiative to end world hunger by 2030. This study is a response to that initiative. Specifically, this study has two objectives. First, this study posits that examining historical trends of crop production can assist in understanding how the world has been able to feed its human population. Using data from the Food and Agriculture Organization (FAO) of the United Nations, this study analyses the harvested area and production of cereals, fruits, pulses, roots and tubers, and vegetables between 1990 and 2020 in Africa, the Americas, Asia, Europe, and Oceania. With that understanding, this study attempts to add to the existing research by shedding some light on whether crop production will be able to satisfy future demand.

Second, crop yields are not affected by just implementing more effective sustainable intensification initiatives; other factors play an important role as well, e.g. climate changes (Eitzinger et al., 2013; Sultan et al., 2019), floods and droughts (Chen et al., 2018; Lesk et al., 2016), pests and diseases (Allinne et al., 2016; Trębicki et al., 2015), soil degradation (Tun et al., 2015), and even political unrest or wars (Fjelde, 2015; Jaafar et al., 2015). Due to the uncertainty of crop production, this study suggests that the sales and operations planning (S&OP) process in supply chain management may be used to devise a crop production planning and control process. Such a process may help maintain a balance between crop supply and demand worldwide.

This study is different from previous studies that have examined the issues of future crop supply and demand. Unlike past studies, which considered only the combined world production of all crops (Tilman et al., 2011) or one or a few specific crops (Fischer et al., 2014; Hunter et al., 2017), this study drills down to crop categories (including cereals, fruits, pulses, roots and tubers, and vegetables) to investigate their production trends between 1990 and 2020 at world, continent, and regional levels. In addition, this study does not make projections of future production growth or yield growth based on existing trends. Instead, this study aims to learn from the historical trends of crop production to generate recommendations from a supply

chain management perspective on crop production planning and control to meet the overall future demand.

In the sections that follow, this paper provides a background on food security and crop production; explains the data source and data analysis; presents and discusses the research findings; and concludes the paper.

2 Research Background

2.1 Food Security

Alleviating food shortage amid a growing population presents a food security challenge (KC, Dias, et al., 2018). The 2019 estimate indicated that about 690 million people worldwide did not have access to affordable healthy diet. Without an effective measure to stop this trend, this number will exceed 840 million by 2030 (FAO et al., 2020). For that reason, the UN's Sustainable Development Goal No. 2 has established a broad objective to completely eliminate hunger and all forms of malnutrition by 2030 (UN, 2015).

To achieve food security targets, the world must work together to ensure food availability, food access, food utilisation, and food stability by improving rural food production, enhancing agricultural productivity, and enabling direct and immediate access to food (FAO, 2006). The importance of food security has also prompted individual countries to implement agricultural interventions such as input subsidies, credit access and insurance, value chain and market development, food stocks, etc. (Bizikova et al., 2020).

An efficient agricultural supply chain, from production, processing, and transportation to international trade, is important to minimise food losses so as to keep food prices affordable. Low agricultural productivity can lead to an imbalance in the supply and demand cycle, resulting in higher food prices which further worsens the food insecurity situation (FAO et al., 2020). In addition, KC, Legwegoh, et al. (2018) reported that another imbalance can be caused by overproducing certain crops but underproducing others. It is therefore necessary to take actions to revamp the food supply system for future sustainability (Bizikova et al., 2020; Gold & Heikkurinen, 2013).

2.2 Crop Production

Crop production is a key component of total agricultural output. FAOSTAT (2022a) classifies about 160 crops into 10 categories, including cereals, citrus fruits, fibre crops, fruits, oil crops, pulses, roots and tubers, sugar crops, tree nuts, and vegetables. While crops are primarily consumed as foods in human diet (e.g. rice, wheat),

some are also used as livestock feed (e.g. soybeans, barley), biofuel (e.g. maize, sugar cane), or raw materials in industrial applications (e.g. cotton) (OECD/FAO, 2020).

Past studies have attempted to estimate the magnitude of increase in crop production necessary to meet the demand in 2050. Although their estimates vary, they all agree on the need to expand future production. For example, Alexandratos and Bruinsma (2012) estimate that global crop production in 2050 should be 60% more than that of 2005/2007. To achieve this target, an annual growth rate of 1.1% is required. Fischer et al. (2014) advise increasing global crop production yield by 45% from 2010 and 2050. To achieve this target, an annual growth rate of at least 1.1% between 2010 and 2050 (or 1.2–1.3% when considering the risk factors) is required. Ray et al. (2013), having examined the yield rates of the top four global crops (i.e. maize, rice, wheat, and soybean), suggest an even higher yearly yield gain of 2.4% between 2008 and 2050 for these crops to be sufficient. Although Tilman et al. (2011) expect an increase of 100–110% from 2005 to 2050 in global crop production to meet future demand, Hunter et al. (2017) contend that, because of improving production growth, cereal production would only need to increase at a smaller percentage of between 26 and 68% from 2014 to 2050.

The availability of cropland for crop cultivation is a major factor in how the world can meet its crop demand. Spiertz (2013) supposes that urbanisation is the catalyst for the shrinkage of cropland globally. Besides cropland loss due to rapid urbanisation (Tu et al., 2021), soil erosion from wind and water also contribute to the loss of croplands (Fenta et al., 2020; Tuo et al., 2018). To prevent land take or conversion for urbanisation which gradually reduces cropland availability, proper land use planning is necessary (Tóth, 2012; van Vliet et al., 2017).

To increase crop production, there are two common approaches. One is to expand the land area for crop cultivation through externalisation, and the other is to increase the yield of existing cropland through intensification (Hu et al., 2020; Ray & Foley, 2013; van Vliet et al., 2017). However, cropland expansion is not considered sustainable due to such negative environmental impact as deforestation. Furthermore, suitable land for cropping is also becoming scarce (Fischer & Connor, 2018; Pradhan et al., 2015). With better agricultural technology, methods, and practices in soil management, pest and disease management, and yield management, sustainable cropland intensification provides a more viable solution amid land scarcity (Lin & Huang, 2019; Pradhan et al., 2015). However, Wu et al. (2018) warn that increasing cropping intensity, if not done sustainably, can still bring negative environmental impact such as soil degradation. In addition, cropland intensification often requires higher agricultural inputs such as fertiliser and pesticide.

Crop production is also affected by crop prices. Crop growers may factor prices into their decisions about what types of crops to sow and how best to allocate the already limited agricultural resources. A crop that often commands high prices can substitute for one of low economic value (Lehmann et al., 2013; Suh & Moss, 2018). To provide financial incentives to the growers, Lin and Huang (2019) suggest that government subsidies will have a positive impact on crop production. Mueller and Binder (2015) point out that market, policy, and socio-political factors also play a

role in crop production. For example, without financial support, growers do not have sufficient resources such as fertiliser for their farms.

3 Research Method

3.1 Data Source

The Food and Agriculture Organization (FAO) of the United Nations provided the dataset for this study. First established in 1945 as a specialised UN agency, FAO has a network of country offices worldwide to help support government initiatives on food security. FAO collects the data through annual production questionnaires which are filled in by its member countries worldwide, national publications, or official country websites. In some cases of incomplete data, FAO uses an imputation methodology to provide an estimate (FAOSTAT, 2022a).

The newest dataset contains detailed harvested area and production data from 1961 to 2020 for about 160 crops, which are further classified into 10 major crop categories (i.e. cereals, citrus fruits, fibre crops, fruits, oil crops, pulses, roots and tubers, sugar crops, tree nuts, and vegetables). Harvested area refers to the area of land that is used for crop cultivation and is measured in hectares. Production refers to the quantity of crop harvested and is measured in metric tons. Production yield is calculated by dividing production quantity with the harvested area (FAOSTAT, 2022a).

With a specific focus on staple foods for human consumption and having predefined 1990 as the baseline year, this study extracted a subset of the data of five crop categories (i.e. cereals, fruits, pulses, roots and tubers, and vegetables) between 1990 and 2020 from the FAO member countries in five continents worldwide (i.e. Africa, the Americas, Asia, Europe, and Oceania). The subset consists of 15 cereals (e.g. maize, oats), 39 fruits (e.g. bananas, oranges), 11 pulses (e.g. dry beans, chickpeas), 7 roots and tubers (e.g. cassava, potatoes), and 25 vegetables (e.g. tomatoes, spinach) (FAOSTAT, 2022a).

In addition, this study also extracted the total population estimates and projections between 1990 and 2020 for individual countries from the annual population dataset of FAO (FAOSTAT, 2022b). The population estimates and projections are compiled by the UN Population Division from the national population census data.

3.2 Data Analysis

To identify the historical trends of crop production, this study examined the data at world, continent, and regional levels and presented the findings using index charts and bar charts. With a baseline year defined, an index chart is suitable for illustrating the percentage changes in production between two different years or across several

years. In contrast, a bar chart is appropriate for comparing the differences in production quantity.

4 Research Findings

In 1990, the world population was estimated to be 5.33 billion people. The population has increased 46.32% since 1990 to 7.79 billion in 2020 and is expected to swell by 82.74% to 9.74 billion in 2050. Table 1 shows the population breakdown of the five continents worldwide. Between 1990 and 2020, Africa recorded the fastest average growth in population (49.49%), whereas Europe registered a negative average growth (−6.37%).

In 1990, the total harvested area used for cultivating the five crop categories (i.e. cereals, fruits, pulses, roots and tubers, and vegetables) was 895.56 million hectares, producing a combined total quantity of 3405.28 million tons worldwide. In 2020, the total harvested area expanded 13.44% to 1015.89 million hectares, producing a combined total quantity of 5969.06 million tons worldwide (an increase of 75.29% since 1990). Table 2 compares the harvested area and production of the five crop categories in 1990 and 2020 in the five continents.

Except Europe, which reported a slight decrease (−5.17%) in 2020, all other continents showed an increase in the production of the five crop categories since 1990. Africa recorded the largest increase (161.20%), followed by Asia (112.07%), the Americas (60.28%), and Oceania (26.18%). While three continents reported an increase in the harvested area: Africa (84.39%), Asia (20.96%), and Oceania (20.90%), two continents reported a decrease: Europe (−31.46%) and the Americas (−0.58%).

Figure 1 depicts the trends in population growth and the production of the five crop categories between 1990 and 2020 in the five continents. In 2020, production outweighed the increase in population in all the continents except Oceania and Europe (production was behind its population growth by 30.15% and 0.15%, respectively). In Asia, production was 65.19% over its population growth, whereas in Africa, it was 48.53%, and the Americas 18.74%. Overall, in 2020, the increase

Table 1 World population (in billion people) and percentage change

Continents	1990 (baseline year)	2020 (*% change)*	2050 (*% change*)
Africa	0.63	1.34 (*+112.68*)	2.49 (*+294.90*)
Americas	0.72	1.02 (*+41.54*)	1.19 (*+64.35*)
Asia	3.16	4.64 (*+46.88*)	5.29 (*+67.42*)
Europe	0.79	0.75 (*−5.02*)	0.71 (*−9.74*)
Oceania	0.03	0.04 (*+56.34*)	0.06 (*+110.18*)
Total	5.33	7.79 (*+46.32*)	9.74 (*+82.74)*

Source: FAOSTAT (2022b)

Table 2 Harvested area (in million hectares) and production (in million tons)

Continents	1990 (baseline year)		2020	
	Harvested area	Production	Harvested area (*% change*)	Production (*% change*)
Africa	117.96	294.05	217.50 (+*84.39*)	768.08 (+*161.20*)
Americas	159.75	701.27	158.81(−*0.58*)	1124.02 (+*60.28*)
Asia	396.41	1518.68	479.51 (+*20.96*)	3220.67 (+*112.07*)
Europe	205.63	855.75	140.94 (−*31.46*)	811.46 (−*5.17*)
Oceania	15.82	35.52	19.13 (+*20.90*)	44.82 (+*26.18*)
Total	895.56	3405.28	1015.89 (+*13.44*)	5969.06 (+*75.29*)

Source: FAOSTAT (2022a)

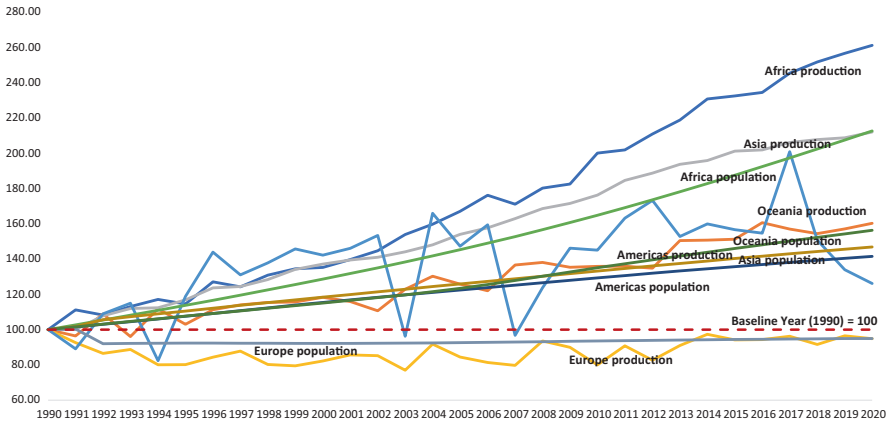


Fig. 1 Trends in population growth and production worldwide between 1990 and 2020. Source: FAOSTAT (2022a, 2022b)

in the production of these five crop categories worldwide (75.29%) was greater than that in world population (46.32%) since 1990.

Table 3 compares the harvested area and the production of the five crop categories between 1990 and 2020 worldwide. Overall, in 2020, the harvested area for all five crop categories has increased since 1990, with vegetables having the largest increase (102.34%), followed by fruits (46.92%), roots and tubers (37.87%), pulses (35.37%), and cereals (4.00%). The production of all five crop categories has also increased since 1990, with vegetables having the largest increase (174.24%), followed by fruits (120.88%), cereals (53.51%), pulses (51.77%), and roots and tubers (47.67%).

Figure 2 provides an overview of the top five producing regions by crop categories between 1990 and 2020. During this period, the top five producing regions accounted for 72.41% of the combined total quantity of cereals worldwide, 65.21% of fruits, 60.65% of pulses, 66.59% of roots and tubers, and 76.76% of vegetables respectively.

Table 3 Harvested area (in million hectares) and production (in million tons)

Crop types	1990 (baseline year)		2020	
	Harvested area	Production	Harvested area (*% change*)	Production (*% change*)
Cereals	707.68	1951.72	736.01 (*+4.00*)	2996.14 (*+53.51*)
Fruits	44.14	401.59	64.86 (*+46.92*)	887.03 (*+120.88*)
Pulses	68.84	59.18	93.18 (*+35.37*)	89.82 (*+51.77*)
Roots and tubers	46.09	574.01	63.54 (*+37.87*)	847.62 (*+47.67*)
Vegetables	28.81	418.77	58.30 (*+102.34*)	1148.45 (*+174.24*)
Total	895.56	3405.28	1015.89 (*+13.44*)	5969.06 (*+75.29*)

Source: FAOSTAT (2022a)

Between 1990 and 2020, the top five cereal-producing regions accounted for 72.41% of the combined total cereal quantity of 73092.04 million tons worldwide. These regions were Eastern Asia (21.43%), Northern America (18.00%), Southern Asia (15.35%), Eastern Europe (9.31%), and Southeastern Asia (8.32%). The top five fruit-producing regions accounted for 65.21% of the combined total fruit quantity of 20170.74 million tons worldwide. These regions were Eastern Asia (25.21%), Southern Asia (14.05%), Southern America (11.69%), Southeastern Asia (7.27%), and Southern Europe (6.99%). The top five pulse-producing regions accounted for 60.65% of the combined total pulse quantity of 2056.45 million tons worldwide. These regions were Southern Asia (27.07%), Northern America (9.35%), Eastern Africa (8.95%), Eastern Asia (7.67%), and Western Africa (7.62%). The top five root and tuber-producing regions accounted for 66.59% of the combined total root and tuber quantity of 22301.78 million tons worldwide. These regions were Eastern Asia (23.14%), Western Africa (16.27%), Eastern Europe (11.01%), Southeastern Asia (8.69%), and Southern Asia (7.47%). The top five vegetable-producing regions accounted for 76.76% of the combined total vegetable quantity of 24596.48 million tons worldwide. These regions were Eastern Asia (50.13%), Southern Asia (13.70%), Northern America (4.56%), Eastern Europe (4.22%), and Southern Europe (4.15%).

5 Discussion

5.1 Historical Trends of Crop Production

Although world population grew an average of 23.05% between 1990 and 2020 (FAOSTAT, 2022b), the combined production of cereals, fruits, pulses, roots and tubers, and vegetables worldwide grew at a faster average of 34.72% during the same period (FAOSTAT, 2022a). Using the global crop production estimates as reported in past studies as a reference point; for example, 60% growth from

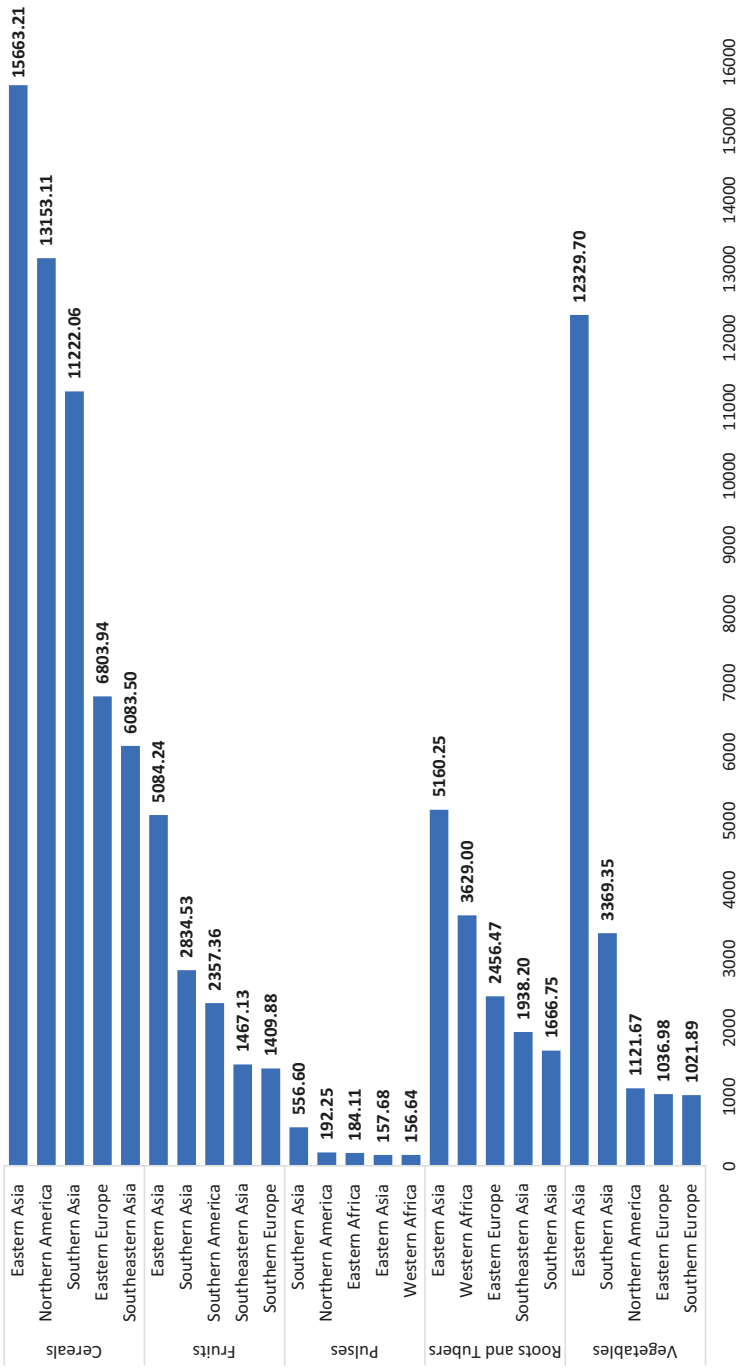


Fig. 2 Top 5 producing regions by crop categories between 1990 and 2020. Source: FAOSTAT (2022a)

2005/2007 (Alexandratos & Bruinsma, 2012), 45% from 2010 (Fischer et al., 2014), and 100–110% from 2005 (Tilman et al., 2011), it can be reasonably assumed that, as production had already increased by 75.29% from 1990 to 2020 (FAOSTAT, 2022a), the world is not far from reaching the upper target of 100–110%. However, it remains to be seen whether the production growth rate can continue and sustain until 2050.

The total harvested area for cereals, fruits, pulses, roots and tubers, and vegetables worldwide expanded an average of 4.05% between 1990 and 2020. However, during the same period, Europe reported that its harvested area had contracted by an average of 26.87%. Another continent that registered a contraction was the Americas (average − 3.30%) (FAOSTAT, 2022a). This finding supports that of van Vliet et al.'s (2017), which in an analysis of global urbanisation of cropland from 2000 to 2040, asserted that as of 2000, Europe recorded the largest loss of cropland, followed by the Middle East and Northern Africa. With a significantly smaller harvested area, Europe was the only continent that reported that its combined production in these five crop categories have contracted by an average of 12.24% between 1990 and 2020 (FAOSTAT, 2022a).

At the level of producing regions, between 1990 and 2020, close to two-thirds of the production of cereals, fruits, pulses, roots and tubers, and vegetables worldwide concentrated in the top five producing regions, of which almost half was in Asia (i.e. Eastern Asia, Southern Asia, and Southeastern Asia). During the same period, vegetables recorded the largest average increase in production (89.47%), followed by fruits (62.02%), roots and tubers (25.33%), cereals (20.81%), and pulses (12.09%). Vegetables also recorded the largest average increase in harvested area (56.97%), followed by fruits (27.29%), roots and tubers (17.99%), pulses (0.41%), and cereals (−1.08%) (FAOSTAT, 2022a).

Although some producing regions have registered smaller harvested area since 1990 (e.g. average − 17.85% in Southern Europe, average − 33.93% in Eastern Europe), these regions still reported an increase in production yields between 1990 and 2020 (e.g. average 25.56% in Southern Europe, average 14.63% in Eastern Europe). This finding regarding production yield also concurs with Fischer and Connor's (2018) claim that some regions face significant yield gaps between farm yield and potential yield (e.g. Sub-Saharan Africa, West Asia-North Africa). With an increasing population, these regions need to import crops to meet domestic demand. On the other, some have relatively small yield gaps (e.g. Europe, USA, Canada, Australia, New Zealand). Not only can these regions meet their domestic demand, they can also export the excess crops. Wu et al. (2018), in an analysis of cropping intensity gaps of global croplands, similarly identified some regions (e.g. Latin America, Asia, Africa) that can potentially increase their crop yields with greater cropland intensification initiatives.

At the level of crop categories, between 1990 and 2020, the world's most produced crop was cereals, followed by vegetables, roots and tubers, fruits, and pulses. The top five producing regions of each crop category accounted for around three-quarters of the total production of cereals and vegetables worldwide, two-thirds of fruits and roots and tubers, and three-fifths of pulses. Eastern Asia was the world's

largest producing region of cereals, fruits, roots and tubers, and vegetables, while Southern Asia was the largest producer of pulses.

In terms of annual production yields, between 1990 and 2020, the top five cereal crops (i.e. maize, rice, wheat, barley, and sorghum), fruit crops (i.e. bananas, watermelons, grapes, oranges, and apples), pulse crops (i.e. dry beans, dry peas, chickpeas, dry cow peas, and dry broad beans), root and tuber crops (i.e. potatoes, cassava, sweet potatoes, yams, and taro), and vegetable crops (i.e. fresh vegetables (not elsewhere specified), tomatoes, dry onions, cabbages and other brassicas, and cucumbers and gherkins) registered an average year-on-year growth rate of 1.30%, 2.05%, 0.36%, 0.25%, and 0.75% respectively. Overall, in some years these crops experienced very good growth rates, but in some years the rates were below 1% or even negative (FAOSTAT, 2022a).

To meet crop demand in 2050, past studies estimate that a targeted annual growth rate should be achieved. For example, 1.1% in global crop production from 2005/2007 onwards (Alexandratos & Bruinsma, 2012), 1.1% in global crop production (or 1.2–1.3% when considering the risk factors) (Fischer et al., 2014), and 2.4% in maize, rice, wheat, and soybean production from 2008 (Ray et al., 2013). The finding shows that except the top five cereal and fruit crops (which met at least the 1.1% targeted rate), the average annual growth rates in production yields of the top five pulse, root and tuber, and vegetable crops were below 1% between 1990 and 2020. This is an indication that there is still room for increase in productivity for better crop yields. FAO et al. (2020) emphasise that substantial productivity improvement can help enhance food supply, reduce food prices, and generate better income for the growers.

5.2 Crop Production Planning and Control Process

From a supply chain management perspective, to meet future crop demand, it is imperative to have an effective crop production planning and control process in place to prevent an imbalance between supply and demand, as well as to ensure the availability of resources (e.g. materials, machinery, human labour) and capacity for the production plans to be feasible (Bozarth & Handfield, 2019). Using this perspective as the point of departure, the S&OP process in supply chain management may serve as a useful guide for stakeholders (e.g., growers, public institutions, traders, governments) in devising a crop production planning and control process. In the case of crop production, this study proposes that a reputable organisation like FAO leads and coordinates the world's crop production planning and control process at international, regional, and national levels. As highlighted by Grafton et al. (2015), achieving food security by 2050 requires global cooperation from international food trade and agricultural investments to environmental sustainability.

In supply chain management, the S&OP process is a monthly planning process that synchronises demand and supply at the aggregate product family level. The process aims to improve production planning in particular, and the output of the

process is a production plan. A production plan is a medium-term tactical plan (e.g. a rolling 18-month planning horizon) that aids in the alignment of a strategic plan (e.g. a business plan) and an operations plan (e.g. production schedule). The production plan specifies the overall monthly production output for each product family, which is then used in the subsequent master scheduling process to generate a master production schedule. The S&OP process prevents the sales and production functions from conducting planning processes that are independent of each other, and assists in balancing aggregate supply (including inventories, backlogs, and production) with aggregate demand (including sales and backorders) (Bozarth & Handfield, 2019; Lapide, 2011; Wagner et al., 2014; Wallace & Stahl, 2008, 2014).

Figure 3 depicts the proposed crop production planning and control process based on the S&OP process. The process could begin with an international steering committee, in consultation with all the relevant stakeholders in the global crop supply chain, to develop a 5-year strategic plan that establishes the mission, strategies, goals, and objectives for the future ahead. This strategic plan would provide the directions for subsequent crop production planning at a tactical level. The production plans would detail the production strategies and production outputs of different crop families in a medium-term time horizon (e.g. 18 months). An international working group could be set up to review the production plans monthly at international, regional, and national levels; and make recommendations to revise the plans according to the demand and production information available at that time. Besides gathering demand information from forecasting and demand management, timely regional or national production information could be obtained from crop monitoring systems equipped with satellite remote sensing (Padilla et al., 2012; Wu et al., 2015). Additionally, besides consolidating demand information, demand management could play a key role in prioritising demand when the supply of certain crops

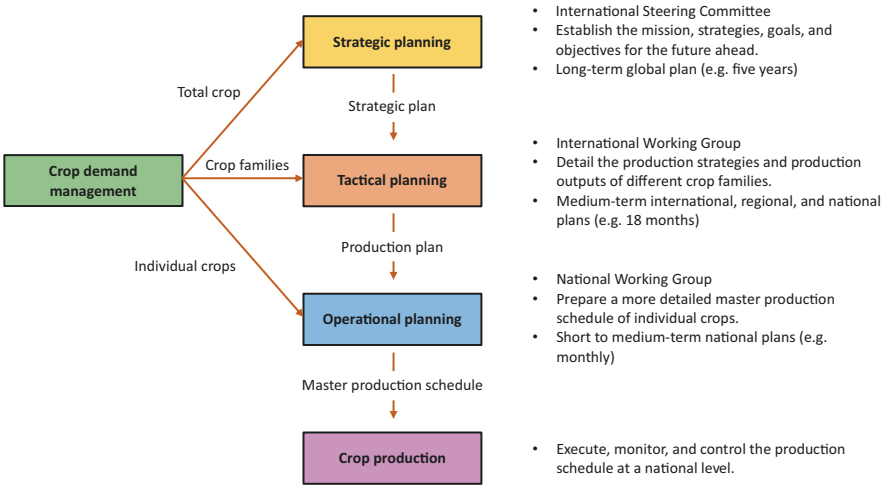


Fig. 3 Proposed crop production planning and control process. Source: authors own illustration

is low. It could also determine the crops that are in demand and deploy different strategies to balance supply and demand when there is a mismatch. At this juncture, it would also be necessary to plan for the long-term resources and capacity that are needed for the production. The production plans could then be used to prepare a more detailed master production schedule of individual crops from short to medium-term at national level. With a master production schedule, growers could then plan the resources required and execute their crop cultivation schedule accordingly.

Such a crop production planning and control process provides several key benefits: (1) It helps to determine production priorities in terms of what, when, and how much to produce in the long, medium, and short terms, while continuously taking the demand for individual crops into account; (2) It provides an iterative feedback loop for production control purposes; (3) It allows periodic updates to the production plans and master production schedules to reflect the latest estimates of supply and demand; and (4) It gives relevant stakeholders such as growers, governments, traders, policy makers, etc. transparent information to make informed decisions. For example, there may be a need to plan importation of crops from other regions to supplement domestic production (McKenzie & Williams, 2015).

6 Conclusion

In conclusion, the findings of this study deliver a mixed message on whether crop production is sufficient to meet the demand in 2050. The combined production of cereals, fruits, pulses, roots and tubers, and vegetables has significantly increased about 75% worldwide since 1990. Specifically, in 2020, the top five cereal crops have already climbed very close to the upper level of production growth as estimated by Hunter et al. (2017). On the other hand, although the average annual growth rates in production yields of the top five cereal and fruit crops have met the 1.1% targeted rate as recommended by Alexandratos and Bruinsma (2012) and Fischer et al. (2014), the top five pulse, root and tuber, and vegetable crops need to still improve their average annual growth rates.

To meet its crop demand in 2050, the world needs an effective and efficient global crop supply chain that enables a high level of collaboration among the stakeholders at international, regional, and national levels in such areas as demand planning, production planning, and logistics planning to achieve the lowest overall production cost, while closing the gaps between supply and demand. An effective crop production planning and control process will help minimise the risk of overproducing or underproducing certain crops, which can cause a sharp crash or increase in crop prices and result in both supply and demand instability in the market. While price crashes can bring economic impact to the growers, price increases will create a disparity in food availability and affordability (OECD/FAO, 2020).

The recommendation for an international implementation of a crop production planning and control process supports the call of the UN's Sustainable Development Goal No. 2 for a sustainable food supply chain that fosters high production

productivity and capacity, enables food price stability, and enhances international collaboration in agricultural trades and agricultural developments (UN, 2015).

There are two research limitations in this study. First, this study only examined crop production data for five major crop categories (i.e. cereals, fruits, pulses, roots and tubers, and vegetables). Future research can analyse the production trends for other crop categories (e.g. sugar crops, oil crops, fibre crops) or livestock to see if there are any patterns that are similar or different. Two, the proposed agricultural production planning and control process is merely conceptual. Future research can conduct small-scale trials of the process with relevant global crop supply chain stakeholders to investigate its efficacy and fine-tune the process before implementing it on a larger scale.

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Exploring the Sustainability Model of the Hospitality Firm: The Experience of a Hotel Group in Europe



Eleonora Cardillo and Maria Cristina Longo

Abstract This paper explores how hotels manage sustainability, recognizing strategies and practices based on the environmental protection and waste reduction. It identifies virtuous paths that can constitute possible models of sustainable business management. We investigate the approach to sustainability of a large company operating in several European countries with a network of more than 250 hotels. We carry out a case study based on questionnaire and reports analysis. We reconstruct the model of sustainability and its implications, considering the environmental impacts, actions and stakeholders social well-being. Findings enhance our understanding how a hotel group deals with the social, environmental and economic issues. Results give insights on how sustainability models work in the hospitality firms. The practical implications concern actions and tools to be adopted by hospitality firms that can effectively implement sustainable business models, especially in the transition phase to sustainability.

Keywords Sustainability · Transition models · Hospitality firm · Innovation · Stakeholders

1 Introduction

The study investigates the sustainability approach in the hospitality firms, called upon to become more responsible. Specifically, the goal of this paper is to understand how firms manage sustainability and which strategies and practices they implement for a sustainable management. Since these are firms that have been operating on the market for some time, we propose to adopt the theoretical framework of transition (Abdelkafi & Täuscher, 2016; Ferasso et al., 2020; Geissdoerfer et al.,

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2018). This approach outlines choices and assessments that lead to sustainability and assumes innovation and action, as basis of analysis. The transition framework highlights the starting points of change, marked by awareness in wanting to transform socio-technical systems and to promote a common vision on the sustainable level to be achieved (Markard et al., 2012; Schäpke et al., 2017; Vinnari & Vinnari, 2014).

Sustainability assumes growing importance in the hospitality sector because of the impact that energy and water utilization have on planet, economy and life of future generations (Font & Walmsley, 2012; Olga González-Morales et al., 2016; Kasemsap, 2017). The tourism sector generates about 5% of planetary greenhouse gas emissions (according to Cambridge Institute for Sustainability Leadership, 2020) and 6.7% of total waste generated by the service sector in Europe (according to the "Best Environmental Management Practice in Tourism sector listed by the European Commission" - 2017). The issue of sustainability of hospitality firms fits into the context of sustainable tourism. It has also been addressed by different international regulatory interventions and operational tools. As is well known, since the "Brundtland Report" (1987) drafted by the "World Commission on Environment and Development" (WCED) on sustainable development, there have been several regulations to define waste disposal, best environmental management practices, global travel standards, sustainability reporting rules such as the GRI guidelines, and the SDGs Sustainable Development Goals.

Studies on the subject have addressed the relevance of sustainable tourism and its links with different areas and contexts of analysis (Del Rosario & René, 2017; Díaz-García et al., 2015; Dwivedi et al., 2019; Moscardo, 2008; Sharma et al., 2020). Among the recurring themes, the most recent one concerns how tourism firms manage the transition to sustainability and how the renewal of business models makes it possible to grasp the synergies between business, economy, and environment (Coles et al., 2017). Another topic of debate concerns the appropriateness of "sustainability performance indicators" and social reporting tools in assessing and measuring the influence of sustainability strategies on business (Dwivedi et al., 2019; Jones et al., 2016). There is the issue of integrating sustainable tourism into a broader debate related to attracting capital and financial resources, improving the qualitative aspects of life and the degree of citizens well-being (Shoeb-Ur-Rahman et al., 2021). This implies identifying the key players and their action to strengthen the path towards sustainability. Besides, some studies (Bohdanowicz & Zientara, 2008; Pérez & del Bosque, 2014) focus on analyzing the link between sustainable approach and the value generated for stakeholders, identifying key areas to improve corporate social responsibility in hospitality companies. Other authors (Martínez-Martínez et al., 2019) examine the relevance of knowledge agents in transferring ecological knowledge that has an impact on the business performance of hospitality firms. Some contributions are more focused on specific areas of the transition to sustainability, such as post-Covid 19 waste management (Filimonau, 2021) or work practices in the waste generation, in water and energy sources use distinguishing between different levels of translation ranging from high to low values (Linneberg et al., 2019). Finally, a growing literature is interested to the topic of sustainable business models

(Ferlito & Faraci, 2022; Nosratabadi et al., 2019) in various fields of activity including fashion, energy, agri-food, construction, hospitality, healthcare, showing how companies generate and captures economic, social and cultural value in a sustainable way.

Within this debate, this paper analyzes sustainable actions and practices aimed at managing the transition towards sustainability, identifying a conceptual model that relates four areas: relationship between sustainability goals and stakeholders engagement; sustainable production and consumption practices, contextual factors and sustainability assessment tools. On a theoretical level, the research provides a new interpretation of the transition process based on several dimensions of analysis. Considering the practical implications of analysis, it helps managers to identify specific areas of intervention to effectively implement sustainable strategies and solutions.

Specifically, this study carries out a qualitative analysis based on a case study which explores the business renewal choices, sustainable performance measurement, and socio-environmental reporting tools of a large hotel with several locations in Europe. The Hotel Group is characterized by a commitment to sustainability that has matured for over a decade. Also, it is a representative example as Hotel adopts effective environmental management practices, certifies sustainability activities, adopts GRI standards, and annually reports on planned sustainable development goals and how they have been achieved.

Although limited to one case only, the reconstruction of the Hotel Group sustainability model is significant and allows us to identify best practices and solutions for the environmental and social approach. Findings show the path taken by hospitality companies to successfully manage the transition towards sustainability. The theoretical model extension to the company under observation is useful for capturing the relevant environmental issues and contextual elements present in the transition path undertaken by a Hotel Group.

This paper consists of seven sections. After introducing the research goals (“Sect. 1”), we give a brief overview on sustainable tourism (“Sect. 2”) and on the literature related to sustainability models in the hospitality sector (“Sect. 3”). “Section 4” presents the research design and the case study structure. Section 5 presents the results of the qualitative analysis, divided into four sub-paragraphs according to the dimensions of the transition to sustainability. Finally, Sect. 6 discusses the results and Sect. 7 highlights contributions and conclusions.

2 An Overview on Sustainable Tourism

The well-known “Brundtland Report” (1987), produced by the “World Commission on Environment and Development” (WCED) defines the “Sustainable development” as a “development that guarantees the needs of current generations without compromising the possibility that future generations will be able to satisfy their own”. In line with the Brundtland Report, tourism activities are sustainable when

they "develop in such a way as to remain viable in a tourist area for an unlimited time, do not alter the environment (natural, social and artistic) and do not hinder or they inhibit the development of other social and economic activities".

Starting from the Brundtland Report, a series of documents have been drawn up by international organizations aimed at defining the concept of sustainability and sustainable tourism in an ever more precise way. The World Conservation Union, United Nations Environment Program and Worldwide Fund for Nature introduce the notion of equilibrium between man and ecosystem within the concept of sustainability; it is "an improvement in the quality of life, without exceeding the ability to load of the supporting ecosystems, on which it depends". The Global Sustainable Tourism Council (GSTC) for global travel and sustainable tourism standards provides measures about the tourism impact on the planet from an economic, social and environmental point of view. In addition, the Best Environmental Management Practice in Tourism sector by the European Commission refers to the correct practices for waste disposal, monitoring and management. The Green Key program is an eco-label awarded to accommodation facilities for hospitality companies. The UNWTO's HES project provides information and technical support to SMEs operating in the European Union on how to increase energy efficiency and the use of renewable energy. The World Tourism Organization together (UNWTO) with the United Nations Environment Program (UNEP) identifies in the 2005 an agenda in which twelve objectives for the development of sustainable tourism are set out. Recently, the "2030 Agenda for Sustainable Development" elaborates 17 SDGs aiming at strengthen European policies on the theme of sustainable tourism and on shared actions to develop greater integration between peoples and nations.

Achieving the SDGs in tourism requires a lot of commitment from the operators of the entire supply chain. There are several negative effects of tourism on the environment: air and water pollution, waste and wastewater pollution, noise pollution, infrastructure and housing settlements not always in harmony with the environment, destruction of the natural landscape, congestion tourism, traffic and pedestrians, excessive and uncontrolled use of natural resources, waste of energy in accommodation and recreational facilities (Melissen & Sauer, 2018). Accommodation and restaurants are the main culprits for packaging waste. The International Tourism Partnership has determined that the hotel industry should reduce greenhouse gas emissions by 90% by 2050 to comply with the Paris climate agreement.

Some studies (Northcote & Macbeth, 2006) have investigated how tourism companies operate in the context of sustainability, highlighting actions and criticalities with respect to different contexts of analysis. In the past, research has instead studied the link between environmental aspects and economic development, trying to evaluate its effects over time. (Hardy et al., 2002). Greater attention has been given to the external context and community involvement. Some results (Lee, 2013) suggest that the local community commitment represents a critical factor that influences the achievement of sustainable tourism development (Lee, 2013).

The concept of sustainable tourism is associated with that of ecotourism, whose main issue is reconciling the profitability of companies with an ecologically sustainable action. Its purpose is in any case to create a satisfying experience for visitors

and increase the quality of life for the local community (Lim & McAleer, 2005). This concept is also connected with the Social Responsibility of the hospitality business (Font & Walmsley, 2012; González-Morales et al., 2016), considering sustainable tourism as the realization of CSR.

In order to understand the concept of sustainable tourism, it is necessary to identify the elements that characterize it, such as the availability of capital, the presence of sustainable resources, the quality of the socio-environmental context, livability and social well-being (Rahman et al., 2021). The concept of "co-management" is consolidated, understood as a balanced decision-making tool that supports the transformation of the structures and processes for destination resources. The governance aspects of the tourism destination are considered relevant in order to generate sustainable livelihood results. Local communities share the principles of environmental, economic and social sustainability and have a positive perception of the contribution that hotels development can make to sustainability (Prayag et al., 2010). The managerial approach of tourism companies is strongly characterized by sustainability strategies that are reflected in customer services and relations with suppliers, in organizational structures, and in the development of greater competitiveness and profitability (Kasemsap, 2017).

One of the most critical objectives of sustainable tourism is that of defining models for evaluating tourism development that involves together economic activities and sustainable development methods. In this sense, Coles et al. (2017) highlight the opportunity to identify synergies between tourism and economy and to define criteria and indicators for evaluating potential tourism developments. Sustainability performance indicators allow to manage innovative processes in the field of tourism and can be adopted to address important challenges in terms of sustainability (Moscardo, 2008).

3 The Sustainability Model of the Hospitality Firms

Studies that have dealt with the topic of sustainable hospitality argue that the path towards sustainability has the main purpose of balancing the quality of the tourist experience and the need to protect nature and environment. Adopting sustainability can generate benefits and even synergies in hospitality firms that need to focus not only on short-term profits, but also on long-term environmental, social and economic performance. The study by Bynum and Muzaffer (2013), based on three case studies of hospitality practices, suggests that the transition to the practice of sustainability can lead to a "competitive synergy" for these companies. The investigated companies reported numerous advantages that emerge from the implementation of sustainable initiatives.

Sustainability should be considered as an element of the management activity, going beyond the adoption of sustainability reports and external guarantee procedures (Jones et al., 2016). The sustainability model cannot be limited to an explicit commitment and expressed actions but requires taking an active role in promoting

sustainability of companies, local governments and communities (Cardillo & Longo, 2020).

The sustainability transition requires initiating "long-term, multidimensional and fundamental transformation processes through which consolidated socio-technical systems pass to production methods and more sustainable consumption" (Markard et al., 2012: 956; Schäpke et al., 2017) interpret the transition to sustainability as a profound process of change in social systems in which social learning and the development of social capital are essential elements of this transition.

Several studies (Santa-Maria et al., 2021) adopt the transition framework to study the changes occurring within the firm and the relative difficulties. The sustainable practices implementation can encounter obstacles that can slow down the model application or limit its effectiveness. In some cases, the transition has led to the study of obstacles to sustainability and the development of actions to overcome these obstacles (Bocken & Geradts, 2020; Vinnari & Vinnari, 2014). Prud'homme and Raymond (2016), adopting a qualitative approach, analyze a multisite case study of five Canadian hotels. They show the ways in which hoteliers have tried to develop a sustainable development orientation. By identifying the contextual factors that influence the way and extent in which sustainability practices have been adopted, it emerges the centrality of the knowledge, skills and tools used by managers. In the same direction, a study (Ayuso, 2006) conducted at the Spanish hotels oriented towards sustainability, illustrates the processes that facilitate or reduce the adoption of sustainable strategies, analyzing the perceptions of the managers on the sustainable initiatives and the practical application of several voluntary environmental tools. And again, another research (Gössling et al., 2012) highlights the importance of analyzing the way in which sustainable development initiatives are interpreted, evaluating the degree of awareness and knowledge of the actors involved. Transition management provides a valid theoretical framework for understanding change processes that are also linked to a dialectical involvement of stakeholders and policy implementation. In addition, the transition requires identifying organizational variables and coordination mechanisms such as specialization, formalization, connection mechanisms and informal social relationships that affect the environmental proactivity and competitiveness of hotels (Ferasso et al., 2020; López-Gamero et al., 2016).

It is also relevant to identify the relationship between sustainability goals, stakeholder engagement and sustainable policy implementation and understanding the power relations between actors in sustainability transitions (Avelino & Wittmayer, 2016; Pérez & del Bosque, 2014). This requires distinguishing between different types and levels of actors, as their power relations influence the understanding of transition policies. To this end, linking the transition to the geographical area means analyzing the connections with the socio-economic context, values and ethics, institutions, and civil society (Köhler et al., 2019). The transition into these relationship systems can become an opportunity to develop new opportunity of economic growth based on sustainability.

The transition framework argues that emerging social changes are leading to a new phase in corporate responsibility, involving transitions within companies.

Based on this approach to transition management, it is important for companies to be proactively involved in sustainability transitions which affect both context and internal corporate transitions (Legrand et al., 2016; Loorbach & Wijsman, 2013; Santa-Maria et al., 2021).

4 Research Design

The research explores whether and how a sustainability strategy can be a source of competitive advantage for a hospitality company by identifying relevant elements to effectively implement sustainability tools and models. Starting from the GRI database, we selected a large Hotel Group, for number of employees, annual turnover, a long engagement to sustainability over the years and high sustainability indexes. For confidentiality reasons, we call it Hotel Group. It represents a successful case in the transition process towards sustainability. We carried our a qualitative analysis through on an interpretative case study (Yin, 2009) in order to grasp the most critical aspects of the transition to sustainability and to better understand which dimensions this Hotel Group leverages to implement a circular economy model. We interviewed the Hotel Group's socio-environmental communication responsible in the 2021 submitting a semi-structured questionnaire. Then, we analyzed content and purpose of the 2019–2021 sustainability report to identify some key aspects in implementing a successful sustainable strategy. We have paid attention to specific concepts that characterize sustainability, including environment, well-being, circularity, gas emissions, food & beverage, waste management, energy saving, water consumption, inclusion, and local communities.

The qualitative analysis investigates sustainable actions and practices adopted by this organization to manage the transition process to sustainability, communication ways, social and environmental reporting. On the basis of the literature considered for the purposes of this research, we identify four areas in which it is possible to place the transition process towards sustainability, that are: Relationship between sustainability goals and stakeholders engagement; Production methods and more sustainable consumption; Contextual factors influencing sustainability; Sustainable processes and pratical application of tools.

A first aspect is related to the *Relationship between sustainability goals and stakeholders engagement*. The company vision takes into consideration the respect and protection of the environment and the models of evaluation and representation of the environment involving the dynamics of the external context. The study of interrelationships with stakeholders is essential for assessing environmental and social complexity. The second ambit is the *Production methods and more sustainable consumption*. The production system, operating within ecological limits, adopts innovative technologies that lead to efficient allocation of resources. The third area involves the *Contextual factors* that influence the way in which sustainability moves. The transition to sustainability implies the adoption of contextual sustainable approaches and a path towards the quality and selection of opportunities

to improve environmental performance. The fourth area concerns *Sustainable processes and practical application of tools*. To measuring sustainability performance, specific tools and systems are implemented. This allows companies to examine actions and processes in order to evaluate, observer and interpret sustainability choices and data.

Through the study of these specific aspects, our analysis is focused on how managerial strategic actions may lead to a more sustainable hospitality management and how hotel deals with the issue of sustainability. The Hotel Group, here investigated, is a very large Hotel Group in Northern Europe comprising approximately 280 hotels with 58,000 rooms in operation. It has activated sustainability actions focusing on four objectives: Diversity and inclusion, Health, Co2 emissions, and Waste. Since 1993 it has activated sustainable development strategies and for some choices, it is one of the first leaders in sustainability. The Hotel Group has promoted several actions in favor of sustainability, such as the phasing out of single-use plastic packaging, improving the accessibility of hotels and the use of sustainable and reusable bottles. The sustainability measures have led to the reduction of negative environmental impacts, increasing the benefits for society and for the ecological system. The Hotel Group in fact supported the Paris Climate Agreement and the United Nations Sustainable Development Goals (SDGs) by evaluating the ability to contribute to sustainable development. A fundamental step is to define measurable objectives to measure and monitor the impact relating to the company's main areas of activity such as the reduction of food waste, the promotion of diversity and inclusion and the choice of hotel activities with a lower environmental impact.

5 Results

5.1 Relationship Between Sustainability Goals and Stakeholder Engagement

Financial goals are linked to the creation of value through economic growth and financial stability not only for shareholders but also for clients, investors, team memberships, property holders, suppliers, and primary stakeholders of company. The Hotel Group considers sustainability a part of the business model.

It has strongly promoted an inclusive culture where diversity can create synergies and therefore better performances. With reference to the distribution by gender, the Group has 64% women and 36% men. Furthermore, the percentage of female general managers is equal to 52%. The Group also engages and hires young people. In fact, of all the team members, around 31%, are under the age of 30. Young people are mainly involved in seasonal activities, so they are temporary employees. The Group therefore plays an important role in creating occasions for young people and enabling them to achieve valuable qualified experience.

Over 120 people of different nationalities work among the employees. This is because the Group seeks to develop a diversified culture to enrich language and professional skills. In this direction, the Talent program was implemented in 2020 in which about 35 people from different countries participated to identify internal candidates to take on possible management positions. The relationship with internal stakeholders is strengthened through a digital check-in format and frequent surveys predominantly to obtain ongoing results and meet employee needs in a timely manner. There are several integration and collaboration initiatives to make the hospitality and work group inclusive and sustainable.

Company has, in fact, carried out training projects to appropriately insert new workers and to offer greater skills in terms of accessibility and safety in hotels. Collaborative relationships are the basis of the global partnership objectives that the Hotel Group wishes to achieve. The company has well-developed partnerships with suppliers and partners, including Global Sustainable Hospitality Alliance. Other stakeholders relate to the company such as public organizations, businesses and institutions in order to create internal and external value. For example, the collaboration with GOT—Gdansk Tourism Organization Network in the hospitality sector it is based on common or shared experiences and on the possibilities of being involved in charitable activities and projects.

The Group defines different groups of stakeholders by identifying specific areas for dialogue and sharing about sustainability. “Team Members” address the topic of customer satisfaction, health and safety and waste reduction. The stakeholder “Owners and investors” focuses on the CO2 emissions reduction, on the decrease of waste and on the commitment by the Board and the Executive Committee towards sustainability. The sustainability criteria are shared with the “NOGs” to reduce environmental impacts and pollution and improve working conditions. Hotel Group with reference to “Future employees” aims to achieve fairer working conditions and raise awareness of environmental issues. The Hotel Group wishes to influence “Guests” on pollution reduction and on the appropriate choices to safeguard health and safety.

With “Corporate customers”, the Hotel Group seeks to create a relationship of trust and attention to environmental impacts. The issues considered with the “Commercial partners” concern the rights and equal opportunities to be guaranteed to all employees and their working conditions.

Another aspect addressed is the social responsibility that is realized with some services offered to local communities. Moreover, many activities are characterized by a social and eco-sustainable approach that makes the service even more appreciated. Sustainability policies, including Diversity and Inclusion and Environment, are adopted by Hotel Group's Board of Directors, and the Executive Committee is also responsible for execution within its divisions.

5.2 Production Methods and more Sustainable Consumption

The Hotel Group seeks to influence its CO2 emission levels and, through the Nordic Ecolabel and EU Ecolabel, it is required to meet the guidelines for CO2 emissions, water and energy utilization, waste controlling and consumption of chemical substances. To limit the use of chemicals and total water consumption, the Hotel reduced the cleanliness of rooms that are occupied by the same customer for several nights.

In addition, water-saving showers and toilets were used and installed in all structures. In this regard, the Hotel Group has promoted the "Close the taps" which encourages guests to consume less water. With reference to the use of chemicals, Hotel Group is increasing the adoption of chemicals that have an environmental sustainability certification and, by collaborating with suppliers and manufacturers, is carrying out a review and control of the pollutants that are present in the products purchased to increase awareness of the chemical impact and the possibilities to reduce it.

Among the sustainable production systems, the one relating to catering and the consumption of products during accommodation is important. The Group has developed collaboration forms for efficient waste management with digital food retailers to sell leftover food and combat food waste.

Hotel Group has built successful partnerships with suppliers to decrease plastic packaging and other polluting waste during the delivery of materials and products to hotels. With reference to Food and Beverage, Hotel Group is increasing the acquisition of plant-based and organic foods, beverages and snacks that are healthy and sustainable. The adoption of responsible consumption and production systems is carried out in many other areas such as the use of plastic and disposable materials, the purchase of biodegradable packaging, the installation of shower heads that reduce water and allow more careful water monitoring. Hotel Group uses renewable sources; in addition, plastic straws have been removed from all restaurants. In the use of materials to furnish hotel rooms and spaces, it tries to use environmentally friendly products, evaluating an adequate useful life of the furniture.

The company ambition is to direct action for sustainability on some fundamental aspects that can innovate the hospitality sector and support change in business logic and practices. The important elements in the corporate vision are inclusivity for many people (MEET), the use of ecological food and drink (EAT) and the guarantee of a sustainable hospitality service (SLEEP). The Hotel Group's work is therefore based on specific daily actions, namely Sustainable Hotel Operations with the general objective of reducing water consumption, CO2 emissions and waste produced. The sustainable operations concern its impact on climate and water, the reduction of food waste and the use of certified and disposable chemicals, seeking to respect the objectives of the Nordic Swan Ecolabel starting from 2022/2023.

5.3 Contextual Factors Influencing the Way in Which Sustainability Moves

The company supports the United Nations Global Compact by operating according to the principles of human rights, labor, anti-corruption and environment. The Hotel Group also adheres to the "International Tourism Partnership" (ITP), an organization that includes large hotel chains around the world that work together to ensure a sustainable approach and to offer and share innovative ideas and sustainability projects. This approach is also appreciated by the guests and also helps to reduce the costs of the company. Organizing the Sustainability Hackathon was an occasion to create ideas on how it can operate more sustainably with the aim of fulfilling solutions across the company. Increased profitability is reconciled with sustainability and an inclusive culture for the environment respect that make team members engaged and motivated.

To strengthen sustainability policies, Hotel Group has joined "HELT MED" in Norway, an organization that aims to support people with intellectual disabilities and to help them get a job opportunity. In addition, it organizes training meetings, seminars and workshops on sustainability in which team members participate to share ideas for promoting sustainability. Another activity is collaborating with digital food scraps retailers to sell portions and help reduce waste. The creation of a platform for the sustainability strategy presents hotels as Nordic Ecolabel certified facilities and as sustainable places to meet, eat and sleep.

In 2020, the Hotel Group, for the third time, obtained an A rating from the "Carbon Disclosure Project" (CDP). The structure was considered a place where there are positive working conditions, in fact the "Great Place To Work" in the years 2018 and 2019, defined it as the most inclusive workplace in the country. In 2019, Hotel Group received credit for its commitment to the Accessibility for which it has organized meetings and training courses. In 2020 and for the previous 10 years, the Hotel Group was designated the most sustainable brand in the industry by the "Sustainable Brand Index"; in some Nordic countries it always scores high.

In the approach to sustainability an important role has been assumed by the cultural platform on diversity and inclusion. Hotel Group believes in the enhancement of diversity, as a set of people with different backgrounds and characteristics, and inclusion, understood as the optimal management of diversity to achieve better results and more solid and inclusive groups. It tries to achieve uniform gender distribution at all levels of the organization and to implement proposals and projects such as the "digital language training".

Partnership activities were also carried out with organizations such as Fairtrade and Rainforest Alliance. Such partnerships also improve working conditions in the supply chain. Another cultural platform is the "Leadership Compass" to spread employee commitment and improve decision making process. Hotel Group has also developed a "Code of conduct" for providers and training and partnership programs to avoid the drug consumption and damaging use of alcohol. The Code follows the

principles of the “United Nations Global Compact” on anti-corruption, work environment, ecosystem and human rights.

5.4 Sustainable Processes and the Practical Application of Tools

The Hotel Group adopts a reporting system for assessing and monitoring the environmental effects of corporate activities. In this sense, the pursuit of environmental policy objectives, such as for example water management and the reduction of waste production, should derive from choices of both economic convenience and environmental impact assessment. The Sustainability reporting system is presented by the company in a clear and usable way.

The annual sustainability report is prepared in compliance with GRI G4, Level core taking into account the GRI accounting principles. It presents an analysis for the management of sustainability risks considering all the aspects of the “United Nations Global Compact”: “environment”, “human rights”, “labor law” and “anti-corruption”.

The sustainability report contains specific disclosures, such as Energy consumption within the organization; Classification of waste by type and method of disposal; Environmental assessment of suppliers; Sustainable footprint; New employee hires and employee turnover; Occupational Health and Safety; Worker participation, consultation and communication on occupational health and safety; Training and education; Average hours of training per year per employee; Diversity and equal opportunity; Diversity of governance bodies and employees; Employee training on human rights rules or procedures; Training on discovering trafficking, prostitution and human rights abuses; Supplier social assessment; Selection of new suppliers identified through social criteria.

The indicators measured by Hotel Group are presented on the basis of the four main areas and specifically:

- Diversity and Inclusion: Share of employees who in the employee satisfaction survey declare that Hotel Group has a good level of diversity within the organization;
- Health: Total employee index in the employee satisfaction survey; Increase of 4 points in employee satisfaction survey regarding recovery from stress, physical work environment and leadership index;
- CO2 Emissions: Share of hotels using renewable electricity, %; CO2 emissions kg/revenue KSEK; CO2 emissions kg /hotel night; % share of hotels that are environmentally certified after opening or rebranding; Water use (m3)/hotel night); Share of environmentally certified chemicals;
- Waste: Total kg waste/hotel night; Recycled waste.

The aspects mentioned above are supported by the presence of a shared corporate culture and the continuous monitoring of the performance achieved by the Group. Hotel Group measures indirect CO2 emissions, direct emissions and other emission categories. *Indirect emissions* include emissions deriving from electricity and district heating / cooling used. The values depend on the choices of materials acquired from suppliers. *Direct emissions* include gas emissions and oil use in operations. It also adopts the "Greenhouse Gas (GHG) protocol" to estimate CO2 emissions, and the use of biofuels is increasing. In fact, many hotels are evaluating the probability of switching to bio-based energies that do not produce polluting releases.

The *other emissions* come from business trips and staying. They are measured through data and information received from travel agents. Built on these data, the "GHG protocol" is used to assess CO2 emissions. The Hotel Group is also looking to reduce aviation-related releases and increase the amount of train journeys and in the future it is considering adopting systems to calculate emissions from the production, shipping or recycling of purchased products and from travel guests.

Other elements supporting the reduction of emissions are the collaboration with suppliers and guests to sensitize them to minimize emissions and therefore to choose sustainable solutions. The measurement of the Sustainable Footprint is carried out by the central sustainability department which defines specific indicators that are monitored regularly.

6 Discussion

Findings show that the Hotel Group adopts cutting-edge procedures and innovative solutions in the transition to sustainable growth. This is in line with the theoretical framework of transition (Bocken & Geradts, 2020; Geissdoerfer et al., 2018) that assumes innovation and actions as drivers of change. In addition, our analysis shows that the sustainability model is based on four dimensions, fueled consistently by actions, practices, tools and evaluation systems (Coles et al., 2017; Linneberg et al., 2019; Ali et al., 2020). The Relationship between sustainability goals and stakeholders engagement is relevant to promote a common vision of sustainability (Schäpke et al., 2017). One of the systems to improve the relationship with key stakeholders is a digital check-in format for a simpler, faster and more frequent dialogue with employees. This tool allows a more immediate and consistent feedback. Another important dimension to manage the transition is monitoring the employees' satisfaction when organizational and structural changes for improving the levels of sustainability are introduced (Avelino & Wittmayer, 2016). Hotel Group measures employee satisfaction by using frequent surveys predominantly to obtain ongoing results and meet employee needs.

Partnerships with suppliers allow for better waste management, reducing environmental impacts and favoring the circular economy model (Filimonau, 2021). The Hotel Group has built successful partnerships with providers to decrease the use of plastic materials in packaging and pollutants when products are transported

and delivered to the hotel structure. To improve production methods and sustainable consumption, plastic straws have been removed from all restaurants, using environmentally products and evaluating an adequate useful life of goods.

One of the main contextual factors in which sustainability moves is encouraging an inclusive culture and respect for the environment that make team members engaged and motivated (Dembek et al., 2018; Loorbach & Wijsman, 2013). There are several integration and collaboration initiatives to make the hospitality and work of the group inclusive and sustainable. Inclusion is considered an important action to support sustainability and change in business logic and practices (Schoneveld, 2020). Hotel Group believes in the enrichment of diversity, as a set of people with different backgrounds and individualities, and inclusion, as the management of diversity to achieve better results and more strong groups. Therefore, cultural interchanges on diversity and inclusion represent relevant aspects associated with the transition to sustainability.

With reference to sustainable tools, an important role is played by the sustainability assessment tools (Dwivedi et al., 2019). The Sustainability Report is integrated in the Annual Report according to the GRI G4 on a self-declared Level Core. It complies with the requirements for sustainability reporting provided by Account Act and the information and data reported on sustainability are guaranteed by Ethos International according to AA1000AS.

According to the literature (Köhler et al., 2019; Marczewska & Kostrzewski, 2020; Nosratabadi et al., 2019), sustainable business model is considered as part of a sustainability-based business strategy. It allows to identify, capture and distribute to stakeholders the social, economic and social value generated by a sustainability approach (Ferlito & Faraci, 2022). Finally, the analysis highlights that the connection between sustainability and the accounting data is still not immediate and that it is necessary to facilitate the understanding of financial data information in favor of the comprehensibility of the report.

7 Conclusion

The Hotel Group investigated have adopted the GRI standards and improved their annual performance according to the sustainability transition. The sustainability strategy of the Hotel Group is based primarily on reducing carbon emissions and energy management and secondly is mainly based on innovation, design and waste reduction through the Lifecyle-management and the materials reuse. The results show how the company supports the path towards sustainability. On the basis of specific elements, the strategic or critical variables for improving environmental performance are highlighted.

Findings offer interesting insights and increase our knowledge on the strategic process and solutions that the hospitality sector undertakes in the transition towards sustainability (Markard et al., 2012; Del Rosario & René, 2017; Ali et al., 2020). The exploratory case study sought to highlight the policies and initiatives adopted

and understanding how these fit into the decision-making processes of the Hotel Group to enhance sustainability and brand reputation. Based on the literature on the subject, the research offers a key to understanding the sustainable processes that lead the company to a circular economy system. The identification of different areas in which the sustainability strategy is framed has practical implications for executives and managers operating in the hospitality sector. The specific dimensions analysed made it possible to frame and evaluate ecological solutions to support the transition and to understand how to implement specific sustainable solutions. The results of the case study offer interpretative insights to evaluate the actions implemented by hospitality firms to measure and communicate the socio-environmental aspects, defining which dimensions are considered strategic and critical to support sustainability. The research has some limitations considering that it is an exploratory study applied to a single case study. Thus, the results cannot be generalized. Future research suggests examining the role of governance system in managing the transition to sustainability. It also suggests analyzing the interactions between different dimensions of the sustainability transition, providing a research model to be tested empirically.

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Organization–Stakeholder Fit in a Military Context: Conflict Resolution Strategies Between a Military Organisation and Military Family



Edgars Joksts-Bogdanovs and Iveta Ludviga

Abstract Successful organizations are often those that can effectively manage relationships with stakeholders, especially in times of turbulence and crisis. This conceptual paper aims to integrate organisation-stakeholder fit theory and dual concern theory to mitigate inherent conflict between military organisation and military families. We develop three propositions linking the conflict resolution strategies between stakeholders to organisation-stakeholder fit related outcomes. We argue that applying compromise or accommodation strategies lead to lower partner satisfaction and lower well-being of the military and their families. We thereby emphasize that collaboration strategy will lead to organisation-stakeholder fit and thus achieve value congruence and strategic complementarity in this organisation-stakeholder interaction. Looking at the cooperation of stakeholders through the prism of the military organisation and the military family creates a more extreme context and can therefore broaden the vision of how to deal with conflicts between the organisation and its stakeholders. Finding and applying successful and effective solutions to the inherent conflict between stakeholders in the military environment can improve the performance of military personnel, thereby contributing to achieving the overall objectives of the organisation and meeting the public interest.

Keywords Stakeholder theory · Organisation-stakeholder fit · Dual concern theory · Military organisation · Military family

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1 Introduction

Stakeholder management is considered an invaluable process in the corporate world (Carter, 2021). It has traditionally recognized the importance of managing relationships between an organization and its many stakeholders (Bundy et al., 2018) since this is leading to organisational success and higher performance (Harrison et al., 2022). Stakeholder theory since its introduction in 1980s has evolved as a significant component of strategic management. The organisation-stakeholder fit theory complements the basic theory, explains both sides' behaviour, and stresses the importance of achieving value congruence and strategic complementarity in this critical interaction (Bundy et al., 2018). As pointed out by the author of the theory, Edward Freeman, the twenty-first century is distinguished for a focus on 'managing for stakeholders' (Freeman, 2018). Similarly, New York Times publication calls this new era of governance 'the age of stakeholders' (Shaugnessy et al., 2022).

Management scholars frequently use the military sphere as a starting point for creating definitions of strategy-related terms (Desjardins et al., 2021). Moreover, researchers suggest that military and business scholars have much to learn from each other and call for further research in the intersection area (Taylor et al., 2013). In current times of business turbulence, and economic and social crisis it might be especially important to look at the context of military organisations which traditionally are experienced in dealing with conflicts and crises.

From the perspective of stakeholder management, a military family is an interesting, important, still under researched stakeholder of a military organisation (Castro & Sullivan, 2018). US military community and family policy (MC and FP) offer a good example of the integration of this stakeholder into a military family system (Menestrel & Kizer, 2019) which might be useful for business organisations. This becomes possible because research shows that contemporary armed forces are losing their institutional characteristics and moving toward an occupational or marketplace-oriented model (Moskos, 1977, 1986). As demonstrated by the Institution-Occupation (I-O) model, the military is shifting away from an institutional orientation (characterized as a sacrifice to society) and is moving toward an occupational orientation (towards just a job) (Moskos, 1986; Taylor et al., 2013). Thus, the military can be studied from the perspective of an organisation, and studying military organisations can teach a lot to strategy scholars.

Poor stakeholder management can be a source of organisation-stakeholder misfit and lead to conflict. The dual concern model is a widely accepted approach in conflict management literature, still, the relationships between the dimensions of concern (for self and others) and choice of conflict resolution strategies have not been validated (Sorenson et al., 1999). Moreover, Oskarsson et al. (2021) call for further research on exploring the perceptions of military family members on the balance of work and private life in the military family.

This conceptual paper *aims* to apply organisation-stakeholder fit theory and dual concern theory to mitigate inherent conflict between organisation and its stakeholders, namely between a military organisation and military families, which might be

leading to organisation stakeholder misfit and lower well-being of military personnel. Looking at the cooperation of stakeholders through the prism of the military organisation and the military family creates a more extreme context and can therefore broaden the vision of how to deal with conflicts between the organisation and its stakeholders. Finding and applying successful and effective solutions to the conflict between stakeholders in the military environment can improve the performance of military personnel, thereby contributing to achieving the overall objectives of the organisation and also meeting the public interest.

In this article, we address this issue of stakeholder management and achieving organisation-stakeholder (O-S) fit in the context of military organization and its' valuable stakeholder—the military family. We discuss the meaning of O-S fit in the context of the military family, in particular partner satisfaction including relationship satisfaction and communication satisfaction. Our theorizing contributes to the literature at the intersection of stakeholder theory and conflict resolution theory, and it differs by analyzing it in an extreme context. Since the family also represents society and thus achieving this fit is of utmost importance. Lastly, we argue in the favour of collaboration strategies which would lead to the creation of O-S fit meaning that military families should be more integrated into the military ecosystem and a collaboration/problem-solving approach should be applied. Overall, this manuscript contributes to research and practice by integrating conflict resolution strategies for achieving O-S fit for understanding how organizations and stakeholders cooperate. The results are applicable in both—military and business organisations.

The paper is structured as follows. First stakeholder theory and stakeholder management is discussed form the perspective of military organisations followed by the analysis of conflict resolution strategies form the perspective of dual-concern theory. Further we propose a conceptual model showing how conflict resolution strategies could lead to organisation-stakeholder fit and state three propositions. We conclude with several avenues of future research.

2 Stakeholder Management from the Perspective of Military Organization

According to the Stakeholders' Theory (Freeman, 1984), any individual or group that can affect or be directly affected by an organisation's actions is a stakeholder (Joshi et al., 2022). Internal or external stakeholder of an organization has a direct or indirect impact on the effectiveness of the organisation's activities and on its results and indicators. The stakeholders of the organization are its employees, customers, suppliers, partners, and all others, who in any way have a direct or indirect impact on the organisation's activities. The Organisation-stakeholder Fit Theory (Bundy et al., 2018) complements the original stakeholder theory by explaining both sides' behaviour and stresses the importance of achieving value congruence and strategic complementarity in this critical interaction. It shows how to ensure

interaction between the organisation and stakeholders resulting in a pattern of cooperation (Bundy et al., 2018) and thus positive outcomes for both.

2.1 Organization: Stakeholder Conflicts in the Context of Military Organization

Conflict risks arise when organisation's activities inhibit the ability of stakeholder groups to reach mutually acceptable settlements (Ganson et al., 2022). There are many sources of potential conflicts in organizational lives and most of them are stakeholder related. Outcomes of such conflicts can be harmful to both sides and are several consequences recognised by researchers and practitioners, for example, stakeholder relationship dissatisfaction, work-life conflict for employees, and resulting in poor organisational performance. According to Hyffman, the main causes of conflicts traditionally are (1) conflict over time: time spent in one role hampers the performance of other roles (Huffman et al., 2014); (2) conflict based on strain: when tension in one role affects the performance of an individual in another; (3) behavioural conflict: when certain behaviour is relevant in one role, making it difficult to meet the requirements of another role (Greenhaus & Beutell, 1985; Wong et al., 2020).

One such conflict for individuals is role conflict. Studies have defined that conflict between the roles of people's lives (e.g., work, non-working life, family) has an adverse effect and human overall satisfaction with life (Greenhaus & Allen, 2011; Sirgy & Lee, 2017). Conflict and dissatisfaction of the parties arise when there is no balanced division of roles, dedicated time, energy, and other resources between involving a person in working life and engaging a person in family life. Clark (2000) has defined work-out-of-work life balance as satisfaction and good functioning at work and home, with a minimum of role conflict. Similarly, Casper et al. (2018) conclude that there is no consensus on how the term "balance" would be defined since individuals tend to have different understandings about what would be a balance between work and non-work areas. According to Casper's definition, the work-life balance is an employee's assessment of a favourable combination between work and non-work roles, but this subjective assessment stems from the level of his acquired experience, from the effectiveness of his involvement in work and out-of-work roles, and from the sensitivity he assigns to those roles (Casper et al., 2018).

Work-life balance also includes objective indicators that can be measured, such as the maximum number of working hours per week compared to the time spent outside work (Guest, 2002). Sirgy and Lee (2017) while discussing aspects of work-life balance and how they interact with each other, implement an inclusive model of work-life research which underlines the importance of conflict forecasting for two dimensions: (1) engaging in work and off-work life; (2) minimal conflict between the two roles. The conflict between work and life arises when uncoordinated pressure is exerted on both sides of life (work; family) (Greenhaus & Beutell, 1985;

Wong et al., 2020). Military professions are a good example of such disbalance because the time spent at work significantly prevails.

There are professions whose performance cannot be accommodated in specific and predictable working hours. As a result, increased demands at work increase the likelihood of conflict in both the work and family contexts, leading to an increase in emotional exhaustion (Hall et al., 2010). According to the Conservation of Resources Theory (Hobfoll, 1989), high-level requirements consume very much personal resources at work (Hobfoll, 2002), which, in turn, is restored to the family environment. A study by Rubio, Osca, Recio, Urien, and Peiró has confirmed the simultaneous interconnectedness and influence between work and family leads to conflict and the emotional exhaustion of employees (Rubio et al., 2015).

One such occupation involves military service. Militarism is known for a demanding working environment and various stress factors affecting military personnel, many of which may have an impact on personal relations and family life (Long, 2022). The military profession is much more than just an occupation—it's a lifestyle. Gilbert (1995) used the definition of "military professional subculture." Coser (1974) and Segal (1986) have both defined the military organisation and the average family as greedy institutions because each of them demands considerable time, energy and commitment, and investment from the individual, and their survival depends to a large extent on the loyalty of their individuals (Vuga & Juvan, 2013).

In the context of military families, this wording is particularly pertinent as the military family experiences unique experiences that are not possible in the daily lives of civilian families. In the context of this research, the term "military family" is used for military personnel and/or: (1) its spouse; (2) their children (including adopted); (3) the parents of military personnel with a common household. Long-term absence of military personnel, periodic changes in the family residence, unscheduled working hours, service in the mission area, and increased risks of life and injuries may lead to conflict and stress in service and off-work life (Huffman et al., 2014), and affect all other family members, as the family is organised and mutually linked parts in a hierarchical structure, so each member of the family has a permanent reciprocal impact on each other (Cox & Paley, 1997). Militants face unique challenges to be able to balance between service responsibilities and family responsibilities. Staff in service should be prepared for stressful and unpredictable situations and duties in 24/7 mode, often with a very short or even no prior warning (MacDermind & Southwell, 2011).

Given the specific nature of the military organisation, specific requirements are also extended to all its stakeholders, potentially leading to greater conflict between the parties than would be the case in a similar civilian environment. Similarly, the emergence and escalation of conflicts between stakeholders in the military environment can potentially have serious consequences not only for stakeholders but also for society as a whole, both by reducing the effectiveness of military forces and by causing other unpredictable societal consequences. The studies concluded that the well-being of military families is key to the well-being of military personnel, while the health and well-being of military personnel play a key role in the effectiveness

of military forces in the fighting field (Vuga & Juvan, 2013); unresolved family problems can have potentially tragic consequences for both the battlefield and the family (Pincus et al., 2001); the key to the effectiveness of military operations is the health and wellbeing of military personnel, an integral part of which is the well-being of their families (Dandeker et al., 2006). The role of families in recruiting, effective tasks, and maintaining performance is increasingly recognised (Atkins, 2009).

Based on the above we conclude that achieving organisation-stakeholder is extremely important, O-S fit between military and families means good work-life balance, satisfaction with communication and partnership, and absence of work-family conflicts.

While the overall number of studies on military families as systems has increased, empirical efforts to understand the functioning of military families are still lagging compared to the number of studies focusing specifically on the research of people in service (Castro & Sullivan, 2018). From the point of view of the defence services, historically, the focus has always been on the military, while, if we look at the experience of other countries, the US military community and family policy (MC and FP) offers to focus on the military family system rather than the soldier as a separate individual (Menestrel & Kizer, 2019).

2.2 Conflict Resolution from the Perspective of Dual-Concern Theory

To develop conflict-resolution strategies between the military organization and the military family as a stakeholder, the Dual Concern Theory is considered in the context of the military organization and the military family. The dual concern theory from the conflict management literature categorizes conflict resolution approaches as either signalling a concern for others or a concern for the self (Bolino, et al., 2022) as represented by the axes in Fig. 1. In the framework of the Dual Concern theory Langton et al. (2013) proposes five conflict resolution strategies: (1) Competition (Forcing or Fighting); (2) Avoidance (Passivity); (3) Compromise (Conciliation); (4) Accommodation (Yielding); (5) Collaboration (Problem Solving). These five strategies and relevant actions are presented in Fig. 1.

Each of these conflict resolution strategies has specific characteristics and differences that describe them. Cai and Fink (2002) stress that most conflict-resolution strategies are dominated by competition style, usually characterised by a great concern for its own interests and low concern for the interests of the other.

When an avoidance conflict-solving style is applied, it shows unspoken concern for both their own and the interests of the other (Cai & Fink, 2002). It's a non-confrontational style that often shows a willingness to disassociate itself from the problem and ignore it, whereby a small problem can grow into a huge and intractable thing and potentially cause severe consequences.

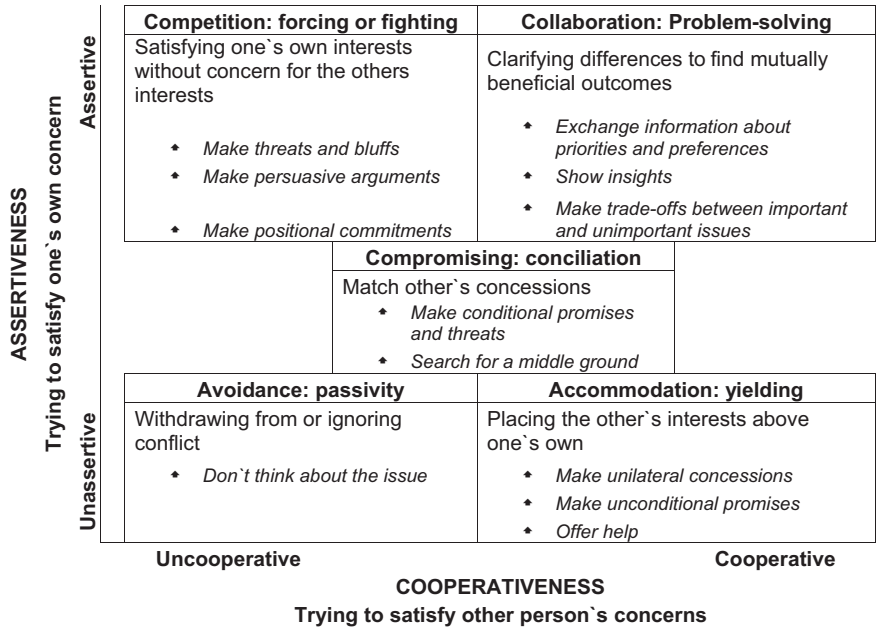


Fig. 1 Conflict-handling strategies and Accompanying Behaviours. Source: based on Langton et al. (2013, p. 200); Cai and Fink (2002)

Compromise's style reflects a moderate concern for its own interests and a moderate concern for the interests of the other interested party. This style reflects a modest effort to achieve a mutually acceptable result, but there is no concerted effort in the process to achieve an optimal outcome (Cai & Fink, 2002).

If there is little concern in the conflict handling of their interests, but the interests of the other involved are at a high level, then according to Dual Concern Theory, the style of Accommodation conflict settlement is applied (Cai & Fink, 2002). The application of this style shows that maintaining a relationship with the other interested party is judged higher than satisfying its interests.

Evans and Steeger (2018) point out that military organizations face a very difficult challenge when simultaneously taking the necessary steps to achieve direct strategic goals, as well as working to create systems and tools to improve the quality of life for staff. In order to attract and retain staff, the military organisation needs to ensure that the military can strike an acceptable balance between service and non-service life and so choose to develop and stay in service (Berndtsson & Österberg, 2022). The conflict between the two sides arises because a person has to play the roles that both stakeholders (organisation and family) expect and there comes a time when satisfying the requirements of one role makes it difficult to meet the requirements of the other.

Dual Concern Theory's conflict-resolution strategies show that successfully overcoming the conflict requires balancing care about achieving its goals with

concern for other people and maintaining healthy relationships (Langton et al., 2013). This balance should be sought by both stakeholders, but since the military organisation is in a position where it has access to instruments and tools which, from a unified central position, can help to balance these concerns, it can create conditions in which the military family would feel sufficiently valued and important for organisation. This feeling could help the military to maintain the balance in the family as in the system. The military organisation should play a key role and responsibility in this process. To adapt the Dual Concern theory to the specific military environment and its stakeholders, we propose extending the use and understanding of the concepts of Dual Concern Theory: (1) extending the concept of "concern for yourself" to the concerns of both the military and family interests and needs; (2) extending the concept of "concern for others" to the interests of all society.

3 Propositions and Conceptual Model

As a positive result of the military organisation and military family fit (O-S fit), can be considered a model in which: (1) the military partner/family is satisfied with the opportunities offered by the military service and the status of the military family; (2) there is a low level of organisation and family conflict. As a positive outcome, the resilience of the military family will be enhanced, thereby increasing stability not only in the family as the system but also by promoting the resilience of each family member, including the military, which will result in the performance of the military personnel and the quality of the performance of their duties. This will, in turn, contribute to the overall tasks of the military organisation, thereby respecting and defending all societal interests. Family resilience is defined in this context as the ability of a person or system to maintain a higher level of functioning or adjustment in conditions of actual or significant risk (Orthner & Rose, 2009). Westphal and Woodward (2010) define resilience of the family as the direct ability of the military family to use physical, psychological, social, and mental resources to prepare for, adapt to, and grow from, the requirements of the military lifestyle. Clark (2000) defines individuals as motivated to contribute when they internalise the values of the industry and see the meaning of their duties. This statement can be attributed not only to the military as an individual, but also to the military family as a whole because when each family member and family as a single system understands their contribution to the common goal and feels that the organisation appreciates family engagement and shows an interest in informing and well-being family members, there is a sense of unity and a sense that each gear is important in this mechanism.

Considering the above, we conclude that organisation-stakeholder fit—the mitigation or prevention of military organisation-military family conflicts is directly related to the quality of the performance of the duties of the military personnel and family support for the military service, which also has an impact on the achievement of the objectives of the military organisation and has an impact on public interest. Figure 2 presents the proposed theoretical model linking conflict resolution

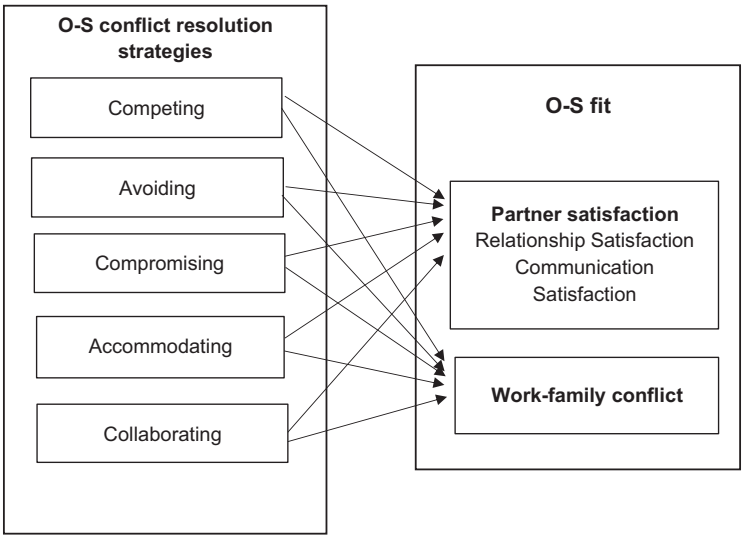


Fig. 2 Proposed theoretical model for achieving organisation—stakeholder fit thru the choice of conflict resolution strategies. Source: authors' own study or based on Langton et al. (2013); Bolino et al. (2022); Bundy et al. (2018)

strategies as presented in the dual concern theory and organisation-stakeholder related outcomes.

The Dual Concern Theory model states that if the party concerned shows a high level of care for its interests, combined with a high level of care for the interests of the other involved, it is likely that the party will choose the inclusive, collaborative-oriented style of conflict resolution (Cai & Fink, 2002). This style is characterised by a willingness to exchange information openly and fairly, to deal constructively with disagreements, as well as by efforts to find a mutually acceptable solution (Gray, 1989; Pruitt & Carnevale, 1993; Rahim, 1992). However, this is not a frequent case in the context of military organisation. Usually, the organization puts the family in front of the fact of the ongoing activities in which the soldier must participate, and therefore the only way for the family is to support their soldier (e.g., compromise). The family is not involved in the daily life of the soldier; therefore they do not always understand the needs of the soldier, which results in communication conflicts and conflicts in mutual family relations. Summarizing the arguments, we propose:

Proposition 1 Military family members mostly apply compromising and accommodating strategies to handle conflict with the military person/organisation.

Proposition 2 Collaborating strategies have the highest impact on partner satisfaction (including satisfaction with communication and relationships).

Bundy et al. (2018) analysing organization–stakeholder fit emphasise the importance of cooperative behaviour—an interaction that exists between the organisation and its stakeholders if their needs are harmonised and both sides are respected as far as possible. Cooperation is promoted by uniquely interrelated factors such as reliability, predictability, engagement, information exchange, and key communication elements that motivate cooperation. According to the Dual Concern Theory, high collaboration and assertiveness, are a balanced concern for their own interests and a balanced concern for the interests of the other involved, resulting in mutual satisfaction and optimal problem resolution. A collaborative conflict-solving strategy could be described as a fair allocation of resources without attempting to lobby the interests of one or the other. This leads to the third proposition:

Proposition 3 Collaborating strategies create less work-family conflict for the military.

According to previous research, when the military service is supported by the spouse of a militarist, the conflicting demands of both stakeholders—to be loyal to both the military and family, are becoming much easier to manage (Huffman et al., 2014). As concluded in the Oskarsson, et al. study, the military career will inevitably be linked to a reduced balance of work and private life (Oskarsson et al., 2021), and it is not possible to avoid it, but the best instruments for restoring and maintaining this balance should be sought.

4 Conclusion

In this article, we have integrated organisation-stakeholder fit theory and dual concern theory to mitigate inherent conflict between organisation and its stakeholders in the context of military organisation, namely between the military organisation and military families. We have identified partner satisfaction and work-family conflict as a consequence of organisation stakeholder misfit in the military family context. This article is in line with Oskarsson's (2021) call for research focused on exploring how military family members could achieve a balance of work and private life in the military family. Following Moskos (1977, 1986) and Taylor et al. (2013) who stated that the contemporary military can be studied from the perspective of an organisation, and agreeing with Desjardins et al. (2021) statement that doing business and waging war have parallels and military have something to teach modern business scholars, this article has made the case that military organisations' stakeholder management has something to teach modern management practitioners. Since stakeholders' mismanagement is an important source of risk (Sadkowska, 2020) looking at the cooperation of stakeholders through the prism of the military organisation and the military family creates a more extreme context and can therefore broaden the vision of how to deal with conflicts between the organisation and its stakeholders.

Military organisations, as well as any other organisation, should be stakeholder orientated since, stakeholder-oriented firms tend to have higher performance (Bundy et al., 2018; Harrison et al., 2022). Finding and applying successful and effective solutions to the conflict between stakeholders in the military environment can improve the performance of military personnel, thereby contributing to achieving the overall objectives of the organisation and therefore also meeting the public interest.

The limitations of our investigation are primarily related to the research context, its conceptual nature, and operationalisation of organisation-stakeholder fit. Thes limitations provide several avenues for future research. First, the current framework focuses on the military context and conceptualise O-S fit as partner satisfaction and absence of work-family conflict. This outcome is equally important also in other organisations. Future research in different contexts could be recommended. Moreover, other indicators of O-S fit could be relevant to other contexts. Since this paper is conceptual, future research is needed to empirically test the propositions. There is a need for new methods and tools to measure the conflict resolution strategies and activities that could be developed. Taking into consideration the importance of understanding ways in which organization-stakeholder fit could be achieved this research could also be extended to other groups of stakeholders.

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Part II
Eurasian Business Perspectives: Marketing

Improving the Purchase Intention by a Color Brand: Verification for Mazda's Kodo Design



Takumi Kato

Abstract Many companies strengthen their perceived value of products by consistently using the same color. The most representative example is Tiffany Blue, which emotionally connects customers and brands and contributes to their differentiation from competitors. In the automotive industry, Mazda consistently promoted Soul Red based on the concept of the KODO design (soul of motion design). In other words, consumers perceive it as a branded color rather than just a color. Some such cases are found in business, but academic literature is surprisingly scarce. This study formulated the following hypothesis in the Japanese market: consumers who are attracted to Soul Red, developed by Mazda's KODO Design brand, have a high purchase intention for that brand. This hypothesis was supported by applying propensity score matching to the responses of an online survey. This study suggests that it is important to make efforts to brand the colors themselves rather than showing them as they are. Hence, practitioners should define not only styling but also color brands under the design brand and consistently appeal to increase the competitiveness of the entire product. Treating color in this way would be more effective than treating it objectively.

Keywords Automobile · KODO design · Perceived quality · Product color

1 Introduction

CMF (color, material, and finishing) is a major component of perceived quality (Piselli et al., 2018), and is used to enhance product appeal in diverse industries such as home appliances and automobiles (Becerra, 2016). Among CMFs, color is the element that has received the most research attention because of its large

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influence. Color conveys consumer psychological attractiveness and promotes purchasing behavior (Bagchi & Cheema, 2013; Marozzo et al., 2020). Although color is a subjective factor, its influence may even exceed the objective factors of the product (Piqueras-Fiszman & Spence, 2012; Van Doorn et al., 2014). In other words, it is impossible to understand the value for consumers by looking only at objective performance data (Ham et al., 2019).

There are three dimensions that define color: hue (e.g., red), saturation, and lightness (Stuart et al., 2014). Though, these are elements that can be measured objectively. As mentioned above, objective data alone cannot understand consumer perceptions. There are a wide variety of subjective elements in color. For example, in business, companies consistently apply a single color over time. This is because it strengthens the relationship between a company and a specific color and makes the color more appealing to consumers (Kato, 2021).

However, existing research lacks a design–brand perspective. For example, Mazda consistently promoted Soul Red based on the concept of KODO design (soul of motion design) (Mazda, 2016). In other words, consumers perceive it as a branded color rather than just a color. Therefore, this study clarifies the influence of the attractiveness of Mazda's Soul Red on the purchase intention of products in the Japanese automobile market. To the best of the authors knowledge, this study is the first to demonstrate the causal effect of a branded color on increasing purchase intention of the manufacturer's brand. The results show the importance of color branding to increase the subjective value of product colors.

This study includes a literature review and hypothesis, then the methodology is explained. Thereafter, the Results, Conclusion, and Implications are discussed.

2 Literature Review and Hypothesis

Efforts to utilize subjective factors in product development and marketing communication are called sensory marketing, and one of the central elements is color (Labrecque, 2020). Color appeals to consumers' emotions (Elliot & Maier, 2014), promotes purchase behavior (Tantanatewin & Inkarojrit, 2018), and increases willingness to pay (Marozzo et al., 2020). The influence of color can exceed objective performance and is an asset that supports competitive advantage for companies (Ettis, 2017). Among the dimensions of color, hue has been the most actively studied. One of the main effects of hue is that it changes the impression of the company or product to which it is applied. For example, white gives an impression of honesty, red gives an impression of excitement, blue gives an impression of competence, black gives an impression of sophistication, and brown gives an impression of ruggedness (Labrecque & Milne, 2012). Lightness and saturation can improve the perceived quality of colors and increase the attractiveness of products (Kunz et al., 2020; Mead & Richerson, 2018; Wilms & Oberfeld, 2018). For example, in an experiment targeting car exterior design, perceived quality was improved by increasing the amount of light reflected (Kato, 2022).

To take advantage of this color influence, manufacturers strengthen their brands by consistently promoting specific colors. For example, Tiffany Blue is a color asset that contributes to differentiation from competitive products (Biswas, 2016). The robin's-egg blue color is registered as a trademark and used strictly as a controlled asset (Tiffany & Co, 2020). Apple has been conveying a cool impression to consumers through gray for many years (Baxter et al., 2018). Since customers feel attached to the colors; hence, the more loyal customers are, the more likely they are to oppose changes in brand colors. In fact, when Apple changed its logo color in 1998, customers complained (Kahney, 2003). In the automotive industry, Mazda continuously promotes the color Soul Red (Mazda, 2016). In the automobile industry, which has a product lineup with diverse characteristics, it is rare to emphasize only a specific color. As mentioned above, it is expected that the movement to utilize color for brand building will become even more active in the future. This is because color has a very large influence and the cost of implementation is very low compared to technology.

Contrary to the brisk business movement regarding branded color, there are very few examples of academic research demonstrating its effectiveness. In the context of products and services, it has been extensively demonstrated that branding increases the influence on consumer attitudes and behavior (Brasel & Gips, 2011; Isa et al., 2020). This study speculated that this effect holds even when the color is targeted; hence, the following hypothesis was derived:

Hypothesis: Consumers who are attracted to Soul Red, developed by Mazda's KODO Design brand, have a high purchase intention for that brand.

3 Methodology

From March 10–14, 2022, an online survey was conducted in Japan among a sample of 1000 people in their 20s to 60s. The survey was randomly distributed to a Japanese research company's panel. All study participants provided informed consent. The condition for respondents was to own one or more cars. Data were collected from 1407 people, and 1000 car owners complete samples were used for analysis. Table 1 lists the respondents' basic attributes.

The questions in this survey were related to (1) gender, (2) age, (3) annual household income, (4) number of cars owned, (5) frequency of driving, (6) interest in cars, (7) right to decide purchase of a car, (8) next purchase schedule, (9) purchasing emphasis point, (10) brand of owned car/s, (11) purchase intention from Mazda, (12) Mazda brand color, (13) recognition of KODO design, and (14) attractiveness for Soul Red developed by the KODO Design brand. Questions (1)–(3) are basic attributes, (4)–(10) are car usage status, (11) are objective variables, and (12)–(14) are questions about KODO design. In question (9), the following options were presented as purchasing emphasis points, and whether or not to emphasize design was obtained; design, usability, drivability, fuel efficiency, durability, price. In (10), major automobile manufacturers were presented as options, and it was confirmed

Table 1 Respondent attributes

Item	Content	Number of respondents	Ratio
Gender	Male	792	79.2%
	Female	208	20.8%
Age	20s	20	2.0%
	30s	99	9.9%
	40s	284	28.4%
	50s	396	39.6%
	60s	201	20.1%
Number of owning cars	0	0	0.0%
	1	693	69.3%
	2 or more	307	30.7%

whether they owned Mazda. Items (11), (13), and (14) were asked on a 7-point Likert scale (e.g., 1: I do not want to purchase at all; 7: I want to purchase very much). In (12), the recognition of red corresponding to Soul Red was detected by presenting 10 options as brand colors associated with Mazda. Through this question, knowledge of Mazda's brand colors was acquired accurately. Since survey items for branded colors targeting automobiles do not exist in existing research, the design was based on the literature related to the industry (Kato, 2022; Liu et al., 2017; Wagner et al., 2018).

If randomization of respondents is possible, it is preferable to conduct a randomized controlled trial (RCT), which is the most reliable scientific basis. In this study, two randomly selected homogeneous groups were prepared: the treatment group was instructed to be attracted to Soul Red, and the control group was instructed not to be attracted. Naturally, it is impossible to control consumer sentiment in this manner intentionally. It is conceivable that the information on Soul Red will continue to be exposed only to the treatment group for a certain period. However, there is sufficient concern that the respondents in the control group will voluntarily acquire information on Soul Red. It was difficult to conduct RCT in this study. Hence, propensity score matching was applied as a hypothesis verification method. Multiple covariates were aggregated into one variable called the propensity score, which was used to correct the covariates in the treatment and control groups. In this study, consumers attracted to Soul Red were in the treatment group, and consumers who were not attracted were in the control group. This method makes it possible to estimate the causal effect with high accuracy in the observation data. As the true value of the propensity score for each subject is unknown, estimation using a logistic regression model is common. To estimate the property score, a logistic regression model was constructed using the variables listed in Table 2. To build the model,

Table 2 Variable list

No	Variable	Description	Data type	Mean	SE
1	Female	Female dummy	0/1	0.208	0.013
2	Age	Age	1: 20s, 2: 30s, 3: 40s, 4: 40s, 5:60s	3.659	0.031
3	Income	Annual household income	1: Less than 2 mY, 2: 2–4 mY, 3: 4–6 mY, 4: 6–8 mY, 5: 8–10 mY, 6: More than 10mY	3.743	0.049
4	Multiple_Cars	Dummy of owning multiple cars	0/1	0.307	0.015
5	Daily_Driving	Dummy of daily driving habits	0/1	0.534	0.016
6	Interest	Dummy of interest in cars	0/1	0.434	0.016
7	Decision	Dummy of holding the right to decide to purchase a car	0/1	0.572	0.016
8	Next_Plan	Next purchase schedule	1: don't know, 2: Within three years, 3: Within a year	2.540	0.022
9	Emphasis_ Design	Dummy of emphasizing design	0/1	0.184	0.012
10	Own_Mazda	Dummy of owing Mazda car	0/1	0.075	0.008
11	Purchase_ Intention	Purchase intention from Mazda	7-point Likert scale	0.233	0.013
12	Color_Match	Dummy of recalling red with Mazda's brand color	0/1	0.472	0.016
13	Kodo_ Recognition	Dummy of recognizing KODO design	0/1	0.682	0.015
14	Kodo_ Attractiveness	Dummy of attractiveness to KODO design	0/1	0.291	0.014

Note: SE means standard error; mY means million Yen

variables of Nos. 13–14 in Table 2 were converted into a dummy variable in which the top two respondents on the 7-point Likert scale are 1, and the others are 0. Table 3 shows the correlation matrix.

The objective variable was a dummy of attractiveness to Soul Red developed under KODO Design (No. 14 in Table 2), and the explanatory variables were other variables (Nos. 1–10, 12, 13). A stepwise method was used for selection. To test this hypothesis, the chi-square test was applied to the matrix of group × purchase intention. The null hypothesis is as follows; "there is no difference in purchase intention in each group." A significance level of 5% was considered to be statistically significant.

Table 3 Correlation matrix

No	Variable	1	2	3	4	5	6	7	8	9	10	11	12	13
1	Female													
2	Age	−0.21												
3	Income	−0.08	0.12											
4	Multiple_Cars	0.00	0.08	0.12										
5	Daily_Driving	0.04	−0.05	−0.12	0.30									
6	Interest	−0.12	−0.15	0.06	0.08	0.10								
7	Decision	−0.14	−0.12	−0.08	0.01	0.14	0.23							
8	Next_Plan	0.03	−0.07	−0.12	0.00	0.05	0.14	0.09						
9	Emphasis_Design	0.02	−0.04	0.07	0.02	−0.06	−0.03	−0.01	−0.03					
10	Own_Mazda	0.13	−0.03	−0.16	0.04	0.08	−0.11	−0.04	−0.05	−0.05				
11	Purchase_Intention	0.01	−0.07	0.04	0.03	0.00	0.13	0.07	0.03	−0.02	−0.02			
12	Color_Match	−0.12	0.01	0.09	0.03	−0.04	0.07	−0.01	−0.04	0.07	−0.10	−0.01		
13	Kodo_Recognition	−0.12	−0.09	0.07	0.04	−0.01	0.33	0.10	0.09	0.02	−0.09	0.12	0.15	
14	Kodo_Attractiveness	−0.02	−0.04	0.10	0.02	0.00	0.20	0.06	0.07	0.04	−0.08	0.26	0.22	0.20

Table 4 Result of logistic regression model to estimate propensity score

Variable	Estimate	SE	p-value	
Intercept	−3.260	0.403	0.000	***
Income	0.124	0.049	0.012	*
Interest	0.639	0.154	0.000	***
Next_Plan	0.229	0.113	0.042	*
Color_Match	0.920	0.150	0.000	***
Kodo_Recognition	0.704	0.186	0.000	***
c-statistics	0.709 (95% CI: 0.675–0.743)			

Note: SE means standard error; ***p-value <0.001; ** p-value <0.01; * p-value <0.05

Table 5 Comparison of both groups after propensity score matching

	Kodo_Attractiveness				
	0		1		
Variable	Mean	SE	Mean	SE	SMD
Propensity_Score	0.359	0.008	0.360	0.008	
Female	0.179	0.023	0.196	0.024	0.046
Age	3.614	0.061	3.593	0.059	0.022
Income	4.036	0.090	3.932	0.089	0.069
Multiple_Cars	0.307	0.028	0.314	0.028	0.015
Daily_Driving	0.539	0.030	0.532	0.030	0.014
Interest	0.582	0.030	0.575	0.030	0.014
Decision	0.596	0.029	0.618	0.029	0.044
Next_Plan	2.586	0.038	2.607	0.038	0.034
Emphasis_Design	0.218	0.025	0.211	0.024	0.017
Own_Mazda	0.054	0.013	0.043	0.012	0.050
Color_Match	0.629	0.029	0.632	0.029	0.007
Kodo_Recognition	0.807	0.024	0.821	0.023	0.037

Note: SE means standard error; SMD means standardized mean difference

4 Results

As shown in Table 4, a logistic regression model was built to estimate the property scores. Interpreting the variables that are significant at the 5% level, the main characteristics of those who are more likely to be attracted to Soul Red are a high annual household income, interest in cars, impression of red in Mazda brand color, and awareness of KODO Design. Matching using the estimated property score resulted in 560 participants (280 in each group). As shown in Table 5, when the two groups were compared, each group was well balanced, and only a slight difference was observed because they met the criteria with a standardized mean difference of <0.1 (Ellis et al., 2021; Ostberg et al., 2022). Next, the chi-squared test was applied to the matched data. As shown in Table 6, a significant difference is detected at the 5% level. Therefore, the null hypothesis was rejected, and the study hypothesis was supported. The odds ratio was 3.256.

Table 6 Result of chi-square test

		Purchase_ Intention		Total	p-value	Odds Ratio (95% CI)
		0	1			
Kodo_Attractiveness	0	233	47	280	0.000***	3.256 (2.195–4.830)
	1	169	111	280		

Note: CI indicates confidence interval; ***p-value <0.001; ** p-value <0.01; * p-value <0.05

5 Implications

While previous studies have shown the effects of various colors, this study expanded it to branded colors. As a Japanese automaker, Soul Red developed by Mazda has received a lot of attention. The significance of this study, which demonstrated the effect on consumer attitudes, is significant. This study has two practical implications. First, when developing colors to promote purchase intentions, it is insufficient to look only at objective characteristics. Consumers' color perceptions are influenced by subjective factors. One of these is the color brand. As the results of this study show, it is important to make efforts to brand the colors themselves rather than showing them as they are. In the automotive industry, there are examples of giving unique names, such as "Platinum White Pearl" of Honda ACCORD (Honda, 2022) and "Ibis White" of Audi A7 (Audi, 2022). However, such efforts are rare, and even in the above example, it is not a color brand that is commonly installed in all products. Second, brand colors should be developed within the design brand. Awareness of design brands may increase the perceived value of brand colors. Hence, it is effective for companies to define not only styling but also color brands under the design brand and consistently appeal to increase the competitiveness of the entire product. In design brands, like styling, color branding should also be considered as a means to attract attention. Treating color in this way would be more effective than treating it objectively.

6 Conclusion and Future Work

Hue, saturation, and lightness are commonly used as the dimensions that define color. However, these objectively defined elements alone are insufficient to understand consumers' perceptions of color. Factors that influence consumer subjectivity have long been the focus of research on consumer behavior, but they are still lacking in terms of color. This study focused on color brands, which had been surprisingly lacking in the discussion. A causal effect was estimated based on an online survey of Soul Red, developed under Mazda's KODO design in the Japanese market. As a result, it was clarified that the attractiveness of the color brand has a positive influence on the purchase intention of the product. The results show that to enhance the

effect of color, it is necessary to broaden the horizons to color branding without being limited to objective indicators.

This study had three limitations. First, only brand colors are considered as elements that make up a design brand. For example, a logo is an important clue. Logo shape, logo simplicity, and logo symmetry influence brand preferences (Bettels & Wiedmann, 2019; Bossel et al., 2019; Lieven et al., 2015). Additionally, the design brand concept plays an important role. To succeed as a strong brand, it is necessary to clearly define the concept before entering the market and maintain the brand image in consumer perception for a long period (Gardner & Levy, 1955). Empathy for the concept significantly impacts a brand's attitude. Therefore, in future research, it is desirable to precisely decompose the components of the design brand, control other elements, and evaluate the effects of brand color. Second, the difference in the effect depending on the attribute was not evaluated. Gender (Fortmann-Roe, 2013), residential area (Xing et al., 2018), and country and race (Sorokowski et al., 2014) have been reported as consumer attributes that cause differences in color preferences. As a product attribute, the effective color changes depending on the body type of the car (Hanss et al., 2012). Based on previous research, the factors that influence the effect of brand color should be investigated in the future. Third, the result is limited to Mazda's KODO design in the Japanese market; therefore, there is a limit to generalization. These topics should be considered for future research.

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Managing Social Responsibility for Health: Challenges in Using Digital Marketing for the Promotion of Paid Services of Healthcare Institutions



Paula Gurtina and Santa Bormane

Abstract The study reflects the trend in the influence of digital tools on consumers regarding the choice of paid services in healthcare institutions. The topicality of the research topic is related to the growing advantages of using digital marketing as well as its wide range of uses, which allows to reach consumers more conveniently and quickly, including regarding paid healthcare services. Yet it does not reduce the social responsibility risks associated with information access for a certain part of society. The goal of the study was to identify which digital marketing tools would positively contribute to the patients' choice in respect of paid healthcare services, through what channels it is most convenient for patients to receive information, and by what criteria patients choose paid healthcare services. The study used the monographic, secondary data, case study, and quantitative analysis (survey by random sampling method) methods. The research data were analysed in cross-sections—by age, gender, education and income level. Overall, the study found differences in terms of the impact of digital tools upon the choice of paid healthcare services among groups of respondents. The consumption of digital tools changes as the respondents' level of education increases, respondents with a higher education choose more tools than respondents with a lower level of education. The respondents are least affected in their choice by paid online advertising tools, followed by process automation tools and content marketing tools, and most affected by website, followed by customer relationship management tools and e-mail marketing tools.

Keywords Consumer behaviour · Digital marketing · Digitalisation · Healthcare · Marketing communication · Social responsibility · Sustainable development

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1 Introduction

The digital environment continues its development, and digital marketing appears on a daily basis in an increasing variety of ways. The digital technologies and software applications of next generations will transform the market and the daily life of people even further (Rindfleisch & Malter, 2019). One of the main factors of its influence is the extensive development of information and communication technologies in the private and public sector which has given rise to a new digital marketing environment. Around 90% of the available global data have been created within the last 2 years (Miklosik et al., 2019), which proves the rapidity of the changes. The CoViD-19 pandemic, too, has unexpectedly become a digital accelerator worldwide. Businesses and markets were forced to adapt to the limited mobility and therefore relied much on the digital technology (Kotler et al., 2021).

This also served as an impetus for businesses to stop hesitating with the implementation of digitalisation. Although the Internet is already part of the daily life, some groups of people are still excluded from the digital world due to the lack of digital skills and knowledge (Hetman & Schaefer, 2019). Importantly as regards digitalisation, there is no one approach that fits all. Each industry and each player is at a different stage of digital maturity. An organisation ready for digital operation assesses the digital readiness of the customer base they compete for (Kotler et al., 2021).

The number of internet users increases every year both globally and in Latvia. However, according to the DESI index for 2021, people in Latvia lack digital skills across all levels, from essential skills all the way to an advanced level. Latvia has scored below the European Union average for digital skills. Approximately half of people still do not have the basic digital skills. Only 43% of people aged between 16 and 74 possess at least the basic digital skills, as opposed to an EU average of 56% (Digital Economy and Society Index 2021). On June 6, 2021, Latvia adopted the Digital Transformation Guidelines for 2021–2027 which are linked with both the Latvian development planning documents (such as the National Development Plan for 2021–2027, the Latvian Sustainable Development Strategy 2030, the Science, Technological Development and Innovation Guidelines for 2021–2027, the Information Technology Security Law etc.) and those of the EU (such as Regulation of the European Parliament and of the Council establishing the Digital Europe programme for the period 2021–2027, the European Data Strategy (COM/2020/66 final) etc.) (Regulation (EU) 2021/695, 2021). The Digital Transformation Guidelines for 2021–2027 adopted on the basis of these numerous documents also deal with a number of processes of digitalising the Latvian healthcare industry. This necessitates a move towards digital marketing in healthcare as well.

While the topic of digital marketing has been relevant in recent years, there is also an increasing number of studies on its use in the healthcare industry. For instance, according to the 2022 study by Pasaribu et al., CoViD-19 demonstrated that, for healthcare institutions, the traditional marketing approaches no longer work and they were forced to increasingly use digital marketing (Pasaribu et al.,

2022). Yet as recently as in 2019, it was found that the healthcare industry is still behind other industries when it comes to using digital marketing activities (Grbic et al., 2019). Meanwhile, a 2023 study on the impact of digital marketing at healthcare institutions concluded that digital marketing tools substantially affect the sales promotion of paid services and the quality of services but there are challenges in their implementation (Chandra & Nadjib, 2023). This is why a detailed study of digital marketing possibilities is needed.

During preliminary research, a number of studies were found regarding the impact of digital marketing upon consumers of different generations, yet there are relatively few studies on the impact of digital tools in Latvia, especially the choice of healthcare services across generations. Hence, it is important to explore whether digital marketing tools reach and act upon all patients equally or there are differences among groups of people (by age, generation, education, income level, gender).

In order for the implementation of digital marketing to be purposeful, it is important for businesses to identify and target their audience accurately. Since certain diseases are more characteristic of certain age groups, it is also important to find out what tools they use. A more accurate targeting of patients will benefit not only patients who will be able to access information about the necessary care more conveniently but also healthcare institutions who will spend less resources in the communication process. Another major benefit may imply social responsibility risks—the increasing need for digital transformation in national economy (stipulated by the state development planning documents) includes digitalisation in the provision of government services, including medicine, which prompts a question whether the use of digital tools does not contribute to the exclusion of certain generations from accessing information and services.

Therefore, the aim of the study is to identify which digital marketing tools would positively contribute to the patients' choice in respect of paid healthcare services, through what channels it is most convenient for patients to receive information, and by what criteria patients choose paid healthcare services. Specifically, whether there are differences in the impact of digital marketing tools upon the decision of choosing paid healthcare services among patients of different age, gender, income and education level.

In order to accomplish the aim of the study, a number of methods were used: (1) monographic—an analysis of scientific literature and studies on digital marketing and its use and impact upon consumers, as well as for the identification of digital tools; (2) secondary data analysis—an analysis of the guidelines, laws and regulations (governing digital marketing and digitalisation in healthcare) adopted in Latvia; (3) a case study of healthcare institutions in the capital of Latvia, (4) quantitative analysis—an online survey by random sample. The survey data on the impact of digital tools upon patients were analysed in four cross sections—by gender, by education, and by income level—to find out the most effective digital marketing tools in reaching audience in the healthcare industry.

The healthcare industry is very complicated and sensitive, including in terms of digital marketing, not least due to the legislation and patient data protection regulations in place. With health being one of the sustainability goals, it was important for

the paper to also analyse the guidelines of laws in order for digital marketing to enhance sustainability in the field of healthcare.

2 Theoretical Aspects of Digital Marketing as a Marketing Communication Tool and Advantages of Using Digital Marketing

As technologies become available to a larger number of people, digital marketing has changed the consumers' buying habits, giving them the following benefits (Bala & Verma, 2018): (1) Staying up to date. The digital marketing technologies allow consumers to follow a company's information; (2) Higher involvement. Thanks to digital marketing, consumers can engage in various activities of a company—for instance, visit the company's website, read information about products or services, make purchases online, provide feedback etc.; (3) Clear information about products and services. Using digital marketing, consumers obtain clear information about products and services. The Internet provides comprehensive product information that consumers can rely on in making their buying decision; (4) Easier product comparison. Many businesses try to advertise their products or services using digital marketing to the greatest benefit for customers as they can compare different suppliers' products or services in a cost-and time-effective way.

Customers do not need to visit multiple retail outlets to learn about products or services. As the digital marketing environment rapidly changes and develops, previous research related to this topic becomes irrelevant (Nikunen et al., 2017). Unlike digital marketing, other types of marketing activities do not allow posting as much textual, analytical, graphical and visual information about a company, its products or services in one place as necessary for building a positive image (Rosokhata et al., 2020).

The Internet as a means of communication is the best way to exchange information with consumers in a full-fledged way, generate demand, and set up a data exchange system—hence, the digitalisation of the business world has resulted in the emergence of digital marketing which is a key component in the adaptation of businesses to these changes. The purpose of using digital marketing is to quickly and flexibly respond to changes in the market and in the consumer needs through digital channels and tools. (Peter & Vecchia, 2021).

Specifically, digital marketing communication deals with what is needed by or what needs to be advertised to the audience, and where the people to be addressed are (Wynne, 2011). Digital marketing communication has emerged as a natural response of businesses to take advantage of the dense concentration of consumers on the Internet. Some businesses are also able to use their own e-commerce platform but for the most part they use the Internet as a channel/environment within the framework of their communication strategy (Miklosik et al., 2019). Digital marketing makes it easier to make an educated, informed choice, as decisions are taken on

the basis of information (Tamal et al., 2021). For instance, one in every twenty *Google* search queries is information about health services, such as tips for health and wellbeing, symptoms of illnesses, nutrition tips etc. In order to appear on the first page of the *Google* search, one uses effective search engine optimisation (Cuomo et al., 2020).

Nowadays, various organisations, including enterprises, hospitals, schools, professional associations, councils and NGOs, use digital marketing as part of their marketing strategies and implementation programmes. Previous research shows that digital marketing gives businesses benefits and each digital marketing tool positively correlates with a sales increase (Yasmin et al., 2015). This indicates that all digital marketing tools contribute to an increase in the company's sales. Online advertising, e-mail marketing, social media and search engine optimisation (SEO) correlates very positively with a sales increase, whereas messages, branch marketing and pay-per-click (PPC) shows little positive correlation with a sales increase (Yasmin et al., 2015). While digital marketing has numerous advantages, there is a vast variety of digital marketing tools and, in order to choose the most appropriate digital marketing tools for a company, one needs to familiarise oneself with their classification and characteristics. The division of digital tools is extensive nowadays. Some authors divide them by content into paid and proactive, believing that marketing tools that create paid digital content (such as search engines, e-mail communication etc.) are currently more influential than those that create proactive content (such as social media) (Ercan & Cizmeci, 2015). For marketing communication tools that create paid digital content, as with traditional marketing communication tools (television, radio, newspaper, magazine etc.), a certain space in the digital environment is rented for a certain period at a certain fee. For digital marketing tools that create proactive content, there is a relatively high degree of interaction between businesses and consumers (Ercan & Cizmeci, 2015). These tools generate an environment where users can post their comments, criticism or suggestions regarding specific issues. For this reason, it is necessary to continuously manage and check the proactive content.

The main benefits of social media for healthcare institutions are: (1) the possibility to give prompt answers to patients' questions; (2) a better understanding of patients, the problems they face in daily activities, their concerns and outstanding needs; (3) the possibility to reach a large audience potentially interested in the organisation's services. (Alma et al., 2015) In this context, most healthcare companies have Facebook pages where tips for a healthy lifestyle, studies on new treatment methods or even interactive games are posted.

As Fig. 1 shows, the review of scientific literature yielded a total of 29 digital marketing tools which were split into 6 groups (paid online advertising tools, website, customer relationship management tools, process automation tools, e-mail marketing, content marketing) (Bormane & Batraga, 2018; Bormane & Putans, 2022) by applicability to healthcare institutions for the promotion of paid services.

At the same time, when using digital marketing tools in healthcare, it should be taken into account, as already mentioned above, that the healthcare sector is relatively complicated—regulatory legislation (advertising law, medical treatment law,

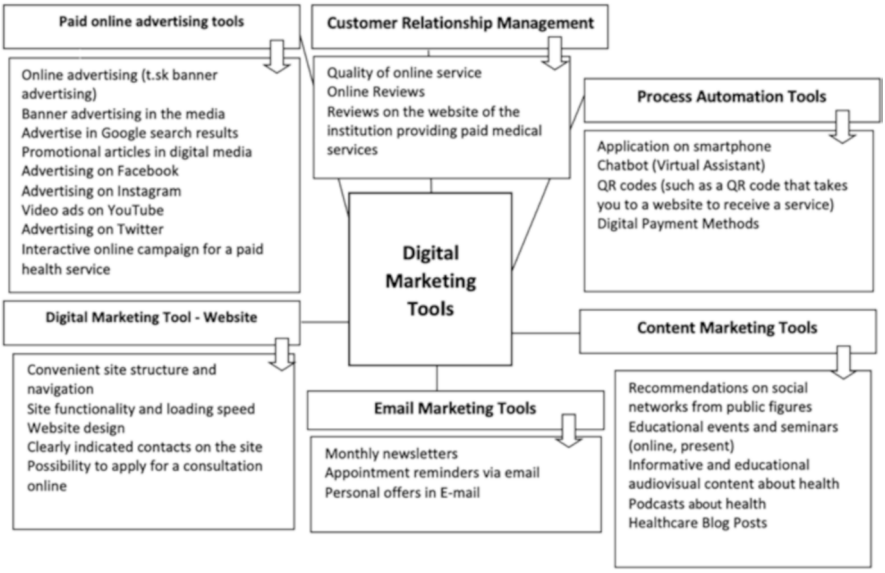


Fig. 1 Distribution of the identified digital marketing tools into groups according to the possibility of use in healthcare institutions. Source: authors own study based on theoretical findings

etc.), data protection (General Data Protection Regulation, Personal data processing law, etc.), state development documents, e.g. digital transformation guidelines (Digitālās transformācijas pamatnostādnes 2021–2027.gadam [Digital transformation guidelines for 2021–2027], 2021), etc. documents. State development documents show that the issues are currently relevant, because the directions of state action are the development of digital skills (e.g. digitally competent citizens who are able to confidently, critically and responsibly use digital technologies and an informed and constantly raising awareness of the use of digital solutions) and the digital transformation of the national economy including healthcare as well (e.g. digitization of processes for the improvement of healthcare and social services creating a digital transformation of the healthcare industry, complementing traditional approaches in healthcare). However, there are also several risks, for example, the lack of public motivation in learning digital skills or using digital solutions of the state administration, certain target groups of the public are not being reached, the aging of the staff of healthcare institutions and the characteristic attitude towards the use of information and communications technology tools.

During the case study, ten health care institutions located in Riga were studied, because currently Riga has the widest choice of healthcare services in all of Latvia. Two state health care institutions and two Riga municipality healthcare institutions, three private clinics and three health centres were selected for the case study. Mostly medical institutions actively use their website, much fewer medical institutions create communication in the digital environment. Private clinics, especially health

centres, use much more digital tools than municipal and state healthcare institutions—incl. paid online ads, podcasts.

3 Use of Digital Marketing Tools in Promoting Paid Healthcare Services. Trends of Consumer Behaviour

3.1 Methods

The study was conducted in several stages. Firstly, to identify the current digital marketing tools, the advantages and disadvantages of digital marketing, the scientific literature was analyzed, as a result, digital marketing tools that can be implemented in the healthcare industry were identified.

Based on the digital marketing tools identified in the theory, in the second stage of the research, a consumer survey was conducted with the aim of finding out the impact of digital marketing tools on the choice of paid healthcare services. The survey was conducted online using the random sampling method over a 1-year period from February 2022 to March 2023.

Since independent decisions about their health can be made in Latvia only by adults, i.e. aged 18 and over, the study was limited to adults only. Also, considering that the population concentration is greater in the capital city of Riga, the opinion of Riga residents of working age was analyzed in the survey. The respondents are working-age inhabitants of the Latvian capital Riga which, according to Riga city economic profile in January 2022 (Riga.lv, 2022) at the time of the start of the survey, makes 380,679 persons (the population size). At 99% confidence with 5% error, the size of the representative sample reaches 665 respondents. In the study, the sample group is 1273 respondents. The survey consists of 8 questions (closed ended, multiple choice questions and multiple choice mixed with rating question).

Demographic questions were developed with a particular attention paid to generational differences, assuming that the preferred digital tools vary among generations: (1) Generation Z—aged 18–27 (starting from 18 because that is the age of majority when one can independently make decisions related to one's health); (2) Generation Y—aged 28–42; (3) Generation X—aged 43–64; (4) aged over 65 (the current age of retirement in the country) (Beresford Research, 2022; Klauss, 2020; Law On State Pensions, 1996; Youth Law, 2009).

Demographic question about income level was categorised on the basis that: (1) the minimum wage in the country in January 2022 was 500 EUR gross for normal working hours (Darzina, 2020); (2) the median wage in the country as at 2022 was 940 EUR net (CV-online.lv, 2022); (3) the average wage (gross) was 1280 EUR (LV portāls [LV portal], 2021); (4) the minimum retirement pension was 149.60 EUR (VSAA, 2021).

It was also important to find out whether the impact of digital tools on health care services varies depending on the education level of the respondents. According to

the education system of Latvia, the distribution of respondents was divided according to primary education, secondary and secondary prof. education, higher education (bachelor's degree, master's degree, doctoral degree). In the framework of this study, it was possible for respondents to mark incomplete higher education as well, to find out whether there are differences in the impact of digital tools in this group of respondents with higher education.

Survey data analysis was performed using MS Excel software, analyzing respondents' opinions in four cross-sections, using ratings mode.

3.2 Results

59% women and 41% men took part in the survey, 70% of the respondents have higher education (bachelor's and/or master's degree and/or doctoral) and an income level above the minimum wage in Latvia, i.e., is in the ranges of 501–1000 EUR and 1001–1499 EUR.

The study reveals that 94% of the respondents have received paid healthcare services at least once in their life, which means that paid healthcare services are in demand, mostly based on the recommendation and availability of a certain specialist doctor. Price, too, affects choice, but, according to the respondents as Fig. 2 represents, it is only the second most important criteria behind the specialist doctor who provides the service.

The results as to the impact of digital marketing tools on the choice of paid healthcare services show differences among respondent groups. For instance, for

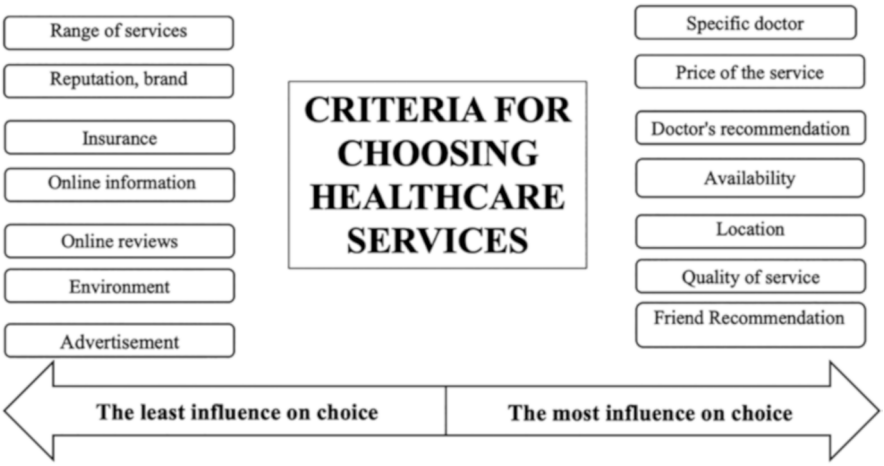


Fig. 2 Choice of respondents regarding paid healthcare services. Source: authors own study based on empirical findings

consumers aged 65 and above, the choice of paid health services is mostly unaffected by digital marketing tools.

The percentages of the impact of each digital marketing tool group are calculated based on the respondents' answers to the question about the evaluation of digital tools—in the question, the respondents had to evaluate the impact of all the tools listed in Fig. 1 in relation to the choice of healthcare services—the respondents evaluated each of the 6 group tools whether it (1) deterred from choosing a healthcare service, (2) negatively influenced the choice of a healthcare service, (3) did not influence the choice of a healthcare service, (4) positively influenced the choice of a healthcare service, (5) promoted the choice of a healthcare service. Figure 3 summarizes results, considering the percentage of respondents' answers about which digital tools positively influenced the choice of a healthcare service and which tools contributed to the choice of a healthcare service together in each group of tools.

Main results about each digital marketing tool group impact on the respondents choice of healthcare service:

1. *Paid online advertising*—does not affect most respondents whereas, for instance, *interactive online campaigns on paid health services* positively affect respondents aged 18–27 and respondents with elementary education and higher education. Furthermore, men are attracted by the aforementioned digital marketing tools more than women.
2. *E-mail marketing tools*, especially reminders of appointment positively affect the choice of the respondents as regards paid healthcare services. Personalised offers and monthly newsletters by e-mail encourage the purchase of paid healthcare services for respondents with secondary and higher education and those aged 28–42, especially men. Older women with higher education, in turn, are affected positively in their choice of paid health services by reminders of appointment and personalised offers. Online service quality and online reviews particularly encourage the purchase of paid healthcare services for respondents with higher education.
3. *Customer relationship management tools* affect the choice of paid healthcare services for men aged 18–27 with income between 1001 and 1499 EUR, and online service quality encourages men aged 43–64 with income above 1500 EUR. Overall, regardless of gender, online reviews positively affect the respondents more than reviews on the institution's website.
4. *Website.* The study identified the option to book appointment online, website functionality/loading speed and convenient website structure and navigation as

Paid Online Advertising Tools	Email marketing	Website	Content marketing	Customer relationship management tools	Process automation tools
20.4%	47.7%	85.5%	46.7%	66.5%	29.2%

Fig. 3 Impact of digital tools that positively influences and promotes the choice of paid healthcare services in the assessment of respondents, %. Source: authors own study based on empirical findings

the most conducive to the choice of paid healthcare services. Based on the respondents' answers, the website has the most positive influence and promotes the purchase of paid health care services. In general, the only groups of respondents whose choice is not influenced by the website are respondents over 65 years old and respondents with primary school education.

5. *Process automation tools*—the respondents (especially those with secondary and higher education) have indicated mobile application, QR codes and digital payment options as tools conducive to the choice of paid health services. The respondents (especially men with higher income across all age groups) are sceptical towards the impact of chatbots or virtual assistants on their choice. Women, in turn, see the impact of process automation tools as neutral and rather positive.
6. *Content marketing tools* is more non-choice-influencing than choice-influencing regarding the choice of paid healthcare services. The tool that was chosen most by the respondents of all groups is informative and educational content about health and its preservation.

In response to the research objective, the use of digital tools does not negatively affect the choice of paid services offered by the hospital—the usage of digital tools improves the choice of paid healthcare services, so the use of various digital tools in the digital marketing activities of healthcare institutions is evaluated positively. The consumption of digital tools changes as the respondents' level of education increases, respondents with a higher education choose more tools than respondents with a lower level of education. Regardless of gender, income and education, respondents in the 18–27 age group are more influenced by digital tools than other age groups. On the other hand, respondents older than 65 years are practically not affected by digital tools at all, except for a few individual cases for respondents with a certain education, salary, and gender. It can be concluded that the influence of digital tools on the choice of paid healthcare services for men and women varies in different age groups, which should be considered when promoting a particular paid healthcare service using digital marketing tools. For example, men are positively influenced by content marketing tools, while women are more influenced by paid online advertising tools. The following tools encourage and positively influence the choice of paid health care services: clearly indicated contacts, the possibility to apply for a consultation on the website, the quality of online service and the functionality of the website, speed. On the other hand, tools such as advertising on the Twitter platform, advertising banners in the media (eg.delfi.lv, tvnet.lv) encourage and positively influence respondents the least.

The most important criteria for the respondents when choosing paid healthcare services is the specialist doctor who provides the paid healthcare service, the price of the paid healthcare service, and recommendation from a specialist doctor. The criteria indicated as the least important are advertising (TV, radio, newspapers, outdoor advertising), healthcare institution environment, online reviews.

As the channel through which it is most convenient to receive information about paid healthcare services, respondents choose the website of the health are institution, e-mail and social networks, while the least respondents choose such channels

as text messages, online advertising, incl. on various websites, etc., as well as in the mass media. Some respondents indicated that they do not like to be bothered unnecessarily, and if necessary, they search for the information of interest on paid healthcare services themselves. Comparing this study results to similar studies from different countries, e.g. in Romania (Alma et al., 2015) people below 50 years tend to firstly check information about treatment options before they got treatment, but people over 50 years tend to do opposite thing—they firstly begin treatment and only after that research about treatment options. This is consistent with the results of this study that younger people are generally more interested in searching for information online, including healthcare. Other study shows, that people prefer to search for patient reviews on the social media and healthcare institutions website, and positive reviews increases number of patients (Burhan et al., 2021), our study also shows, that people searches for the reviews on the internet about healthcare institution. In Bangladesh (Pasaribu et al., 2022) people also tend to collect information about doctors on healthcare institutions website or on Facebook groups. These results once again show how important digital marketing becomes to healthcare institutions.

4 Conclusion

Currently, digital marketing is a complex of philosophy, strategies and tools for marketing activities and interaction with computer networks that allows to conduct market survey as well as transport, sell and purchase goods and ideas. The use of digital marketing enables businesses to be flexible and adapt to changes in the external environment, build effective relationships with their consumers, and respond more to their needs and understanding. It has been identified that businesses use such digital marketing tools as search engine optimisation (SEO), content marketing, process automation, e-commerce marketing, campaign marketing and social media marketing, social media optimisation, direct marketing by e-mail, e-books, QR codes, applications, optical discs and games etc., and those were split into six groups—online advertising, content marketing, website, e-mail marketing, customer management tools, and process automation tools.

The use of digital tools does not negatively affect the choice of services offered by hospitals—digital tools are rather neutral or conducive to the choice of paid healthcare services. Thus, their use in digital marketing activities of a hospital is rated positively. The results of the study show that the respondents are least affected in their choice by paid online advertising tools, followed by process automation tools and content marketing tools, and most affected by website, followed by customer relationship management tools and e-mail marketing tools. Importantly, across the four respondent groups (gender, age, education, income), there are differences as to the impact of digital tools on the choice of paid healthcare.

Future directions. However, the question of a more detailed study of the habits of using digital tools in groups of different generations in regions where digital skills

are lower than in the capital also remains relevant, in order to understand how big the risk that part of the public unable to access information? The low digital skills of the population living in the regions can seriously affect the benefits of using digital marketing tools by healthcare institutions, because certain groups of the population still, despite the growing number of Internet users, threaten to remain unaddressed and unreached.

Also, one of the future directions of the research can be the readiness of the healthcare institutions themselves to use digital marketing. First of all, it is important to assess digital skills in the institution itself—the digital maturity of the institution, digitalization management, digital skills of the staff, etc. knowledge of digital marketing and the use of its tools, including the opportunities provided by VR (virtual reality), artificial intelligence and robotization, which allow to ensure the economy of resources and open new opportunities for healthcare institutions also in terms of marketing.

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Part III
Eurasian Business Perspectives: SMEs and Entrepreneurship

Understanding the Internationalization Intention of Indonesian Food and Beverages SMEs



Evy Rachmawati Chaldun, Carissa Tibia Walidayni, and Andiva Liesty Amelia

Abstract Globalization has enabled more businesses such as Small and Medium-sized Enterprises (SMEs) to internationalize their product. This study aims to understand what influences internationalization intention within SME owners and how it affects the behavior of SME owners. To understand this behavior, this study utilizes the Theory of Planned Behavior and a qualitative approach with semi-structured interviews as a data collection method. In-depth interviews were conducted with Indonesian Food and Beverage SME owners. Based on the result, SME owners have strong attitudes towards internationalization due to their perspective regarding the importance of internationalization. Subjective norm shows there is a mixed result for some owners. It has a major influence on their internationalization intention while others have a minor influence because they are focusing on their attitude. Through the perceived behavior control point of view, SME owners explain deeper the reason why they can or cannot export their products as well as the degree of their readiness to face the international market. The result of this research creates an addition in literature to an unexplored area of internationalization and understanding the source of SME owners' intentions. Through this study, we also understand that there is another factor that influences internationalization intention which is not categorized in the Theory of Planned Behavior as an opportunity for future research.

Keywords Food and beverage industry · Indonesia · Internationalization intention · SMEs · Theory of planned behavior

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1 Introduction

Despite removal of barriers (Wright & Dana, 2003) and technological advances (Wright & Etemad, 2001) that could supported and enabled SMEs to expand their business across border, data mentioned by Ma'ruf Amin as the Vice President of Indonesia stated only 15% of SMEs in Indonesia that contributes in export (Yeo, 2022) despite the large number of SMEs in Indonesia already reach 64.2 million units (Hermawan, 2022). This situation raises a question about why Indonesia SMEs export number is very low and needs to be investigated even further to understand what is the main cause of low export numbers. Thus, this paper is aiming to understand the reason of SMEs owners' behavior to internationalized their business, study the thought process, and develop insights about how the SMEs owners perceive and act towards internationalizing opportunities. The result of this research contributes in literature and practical implication to understand Indonesia's SMEs situation towards internationalization opportunities and reveal the challenges as well as improvements needed by stakeholders.

This paper brings new perspective to understand SMEs owners' behavior and decision-making process in facing opportunities of export using Theory of Planned Behavior (TPB) as the theoretical foundation that has not been used in other studies under the area scope of Indonesia and mainly focusing on food and beverage industry. Furthermore, the literature investigation indicates that most scholars elaborate on the behavior intention of internationalization SMEs from the motivation (Kubíčková et al., 2014; Olivari, 2016; Pett et al., 2004). We argue that motivation is only one component of the Theory of Planned Behavior (TPB) model. Therefore, the Theory of Planned Behavior is used in this study to understand the reasoning behind an individual's behavior by predicting three variables: attitude, subjective norms, and perceived control behavior (Ajzen, 1991). Three variables of the Theory of Planned Behavior are modified to suit the context of entrepreneurship and internationalization, especially in Indonesia as one of the emerging countries, to include a new perspective still lacking in the previous study.

This study also focuses on SMEs in food and beverage industry that according to Indonesia Cooperatives and SME ministry seen as one of the sectors that has high demand nationally and internationally (Rahman, 2020). Yet despite the high demand, export number still very low due to challenges such as sanitation, food safety, and destination countries' regulation. Previous study on SMEs in food and beverage industry focuses on innovation process (Prihadyanti, 2013), product quality (Dhewanto et al., 2021), and organizational or entrepreneurial case study (Srimulyani & Hermanto, 2022; Wanto, 2012). After introduction section, this paper continued with literature review, research method, results and discussion, and conclusion.

2 Literature Review

2.1 Internationalization Intention

The literature shows a shortage of agreement on the definition of intention for internationalization. Ruzzier et al. (2020) define the intention to internationalize consists of three areas which is the intention to develop and manage a new business enterprise, the second is the intention to survive, grow and achieve the best performance, and the intention to be an internationalized company. Meanwhile Krueger et al. (2000) define intention as a behavior that results from evaluating opportunities captured from a specific business environment. Obschonka et al. (2010) define entrepreneurial intention as a cognitive process that directs an individual to show planned entrepreneurial behavior in response to the environment.

In the context of internationalization, entrepreneurs identify opportunities in overseas markets. After valuing the chance, they will develop an action plan to help them make the opportunity profitable for their business. On the other hand, some barriers and risks should be overcome to catch up with the international opportunity. Foreign markets are very demanding. Therefore, entrepreneurs must prepare well to meet product quality that follows the market need and the standards in the destination country (Calantone & Knight, 2000; Pasape, 2018). They must also consider the various risks that may arise, such as changes in product quality or product damage in the delivery process, delays or failures in payments, political and various uncertainties (Ahmed et al., 2002; Pezderka & Sinkovics, 2011). The cognitive process is complicated, and deciding to pursue an international market opportunity is more challenging than the domestic market. Therefore, the intention of internationalization can be interpreted as a cognitive process that directs the behavior of entrepreneurs to expand their business beyond national borders.

2.2 Theory of Planned Behavior

Decision to enter international market is a result of complex process inside entrepreneur's mind which is why we apply the Theory of Planned Behavior to understand how this intention is formed. This theory consists of three primary constructs: attitude, subjective norm, and perceived behavioral control.

2.2.1 Attitude

Attitude speaks about beliefs that are separated into behavioral beliefs and evaluation of behavioral outcomes. To understand the attitude in entrepreneurship context, this study adapts entrepreneurship orientation as a main framework due to similarity of definition and purpose. Attitude defined by Ajzen (1991) as the measurement of

an individual's positive or negative evaluation of behavior performance which comes from behavioral beliefs and evaluation of behavioral outcomes. Meanwhile, Entrepreneurial Orientation (EO) is defined as a frame of mind with an entrepreneurship perspective that can be shown in the firms' ongoing business processes and corporate culture (Dess & Lumpkin, 2005). EO helps the firm to establish decision-making styles and strategy-making practices to run the entrepreneurial activities within the firm (Hughes & Morgan, 2007). Both attitude and EO have the same concept of "perspective" which affects certain outcomes and requires judgment before making the final decision of the behavior which individuals take.

Entrepreneurial orientation is linked to five dimensions that express the entrepreneurs' quality or attributes which consist of autonomy, proactiveness, innovativeness, competitiveness, and risk taking (Lumpkin & Pidduck, 2021). It is relevant to consider using entrepreneurial orientation to identify the business owner's attitude because business owner as an individual play a major part to take business decisions and navigate the business direction. By asking the value and importance of five dimension within entrepreneurial orientation, we can identify what is the most important value beliefs and how the business owner perceived that value beliefs which then can generate the overall outlook of business owner's attitude towards internationalization intention that drive the behavior to internationalized their business. In this paper, EO value beliefs become the reference to identify which beliefs matter the most to generate internationalization intention and how SME develop their views towards these beliefs that will be explained in detail on Table 1.

Table 1 Entrepreneurial Orientation (EO)

Dimension	Belief Statement Keynotes
Autonomy	Independent action
	New insight
	Freedom
Proactiveness	Seek opportunities
	First mover
	Bias for action
Innovativeness	R&D Investment
	New technology
	New products and services
Competitiveness	Up-to-date
	Responsive
	Competition boost productivity
Risk-Taking	Take chances
	Take bold actions
	Financial risk

Source: Author's summary based on Lumpkin and Pidduck (2021)

2.2.2 Subjective Norm

Subjective norm is often identified with perceived social influences or pressures an individual receives, which that individual can choose to take or not the given behavior (Ajzen, 1991). Subjective norms can influence or pressure an individual to perform or not perform a particular behavior. The aim of identifying subjective norms in this study is to see whether the business owner's actions to take internationalization are being influenced by other factors outside of their own belief. From there, we can discover factors that might drive the intention to internationalization and how far the subjective norm can influence the individual's decision regarding internationalization intention.

Based on Ajzen (1991), two aspects precede and form a subjective norm: normative beliefs and motivation to comply. Normative beliefs are social that are constructed based on and generated from collective individuals' perceptions of behavior that meet specific rules or standards. There are five truths about normative beliefs (Crano & Prislin, 2011) that generally accepted which is:

(a) Generated from social interaction
(b) Influence behavior when they come from a close referent group
(c) Influence behavior in ambiguous situations
(d) Influence public behaviors
(e) People know when they have been influenced by normative information

Each normative belief has its own strength depends to how much the individual willing to comply towards that preferable behavior which is known as motivation to comply (Ajzen, 1991). Thus, each normative belief might have different result depends on how much the individual care about the peer groups that influence a certain behavior.

2.2.3 Perceived Control

Perceived behavior control defined as the individual's perception regarding ease or difficulty of executing a certain behavior of interest (Ajzen, 1991). Another concept that is compatible with the perspective of perceived behavioral control is concept of perceived self-efficacy (Bandura, 1982). Self-efficacy beliefs can affect possible courses of action to be taken, preparation to take that particular action, how much effort the individual gives during performance, and also thought patterns as well as the individual's emotional reactions (Bandura, 1982, 1991). Through previous studies, it shows that an individual's behavior strongly influenced and related to their perspective of confidence in their own ability to perform a certain behavior.

The concept of perceived behavioral control is to understand non volitional elements within an individual's behavior. The general rule is that a high level of perceived behavioral control may cause a rise of an individual's intention to execute that particular behavior while the low-level perceived behavior control may demotivate the individual to execute the behavior (Barua, 2013) Additionally, perceived

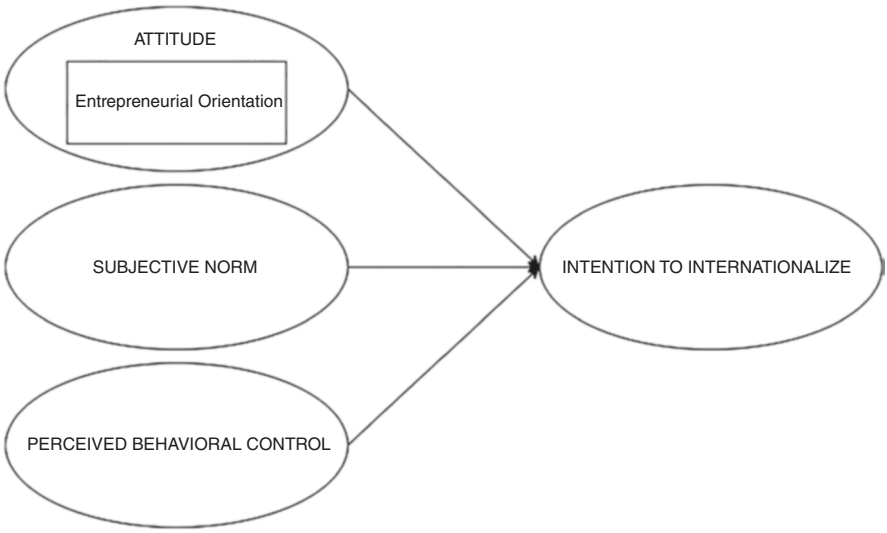


Fig. 1 Theory of Planned Behavior framework with entrepreneurship perspective. Source: Authors own work, based on Ajzen (1991)

behavioral control is also very useful to assess an individual's actual control for a particular situation that is most likely to influence the individual's intentions and change the course of behavior that they would take indirectly.

The theory of Planned Behavior is an acceptable and reliable framework for identifying individual behavior through an entrepreneurship perspective (Fig. 1). The novelty that this paper brings as a contribution to the literature is to identify the process of how SMEs owners perform the behavior of internationalizing their business by identifying and analyzing the SMEs owner's attitude, subjective norm, and perceived behavior control that leads to internationalization as the desired behavior. Understanding how internationalization behavior happens and what essential matters need to be considered before taking steps toward internationalization will become a reliable source of reference for other SME owners considering internationalization as their next business strategy.

3 Research Method

This paper takes a new perspective of Theory of Planned Behavior into an unexplored field of business, specifically SMEs in the Food and Beverage industry in Indonesia. Qualitative approach is the most suitable method to investigate and develop existing theory with new perspective. The result of this method can bring deeper understanding of a current phenomenon (Frankfort-Nachmias & Nachmias, 1996) and interpret the meaning of a phenomenon that people bring to them (Denzin

& Lincoln, 2008). In addition to that, a qualitative approach capable of capturing perspective beyond objective point of view to describe subjective judgments that consists of the individual's attitudes, behavior, motivations (Creswell & Creswell, 2017) or judgments that occurred due to a certain situation. Through qualitative approach, SMEs owners' intention towards internationalization can be answered with details of their reasoning behind that intention how far they already act towards their internationalization intention.

This paper uses a purposeful sampling approach by Patton (2002) to guarantee the understanding of the most fundamental aspects and collect a particular richness of information that this research needs (Denzin & Lincoln, 2005). To gather the participants that fulfill the requirements, the researchers contact the Department of Industry and Trade in 4 different provinces to obtain the SMEs name and contact person in each province. These provinces were chosen based on Indonesia's Central Bureau of Statistics data on provinces with the most food and beverages SMEs in 2019. Other criteria that the researchers implement to choose the SMEs for interview are as follows: (a) Established for at least 2 years, (b) Either already export or have not export yet. The method that the researcher uses to gather the data is to interview the participants and asking 15 questions that the researcher develops using Theory of Planned Behavior. 16 participants from different provinces offering different products were interviewed. From Table 2 the details regarding the participants are shown even further.

The data analysis process of this study uses framework approach by Ritchie et al. (2013) which the details of how the data analysis process works are explained as follows:

Table 2 Participant Data

No	SMEs name	Age	Province	Product	Export status
1	BNC	10 years	West Java	Banana Chips	Already exported
2	YB	6 years	West Java	Cassava Chips	Already exported
3	KTC	8 years	West Java	Tempe Chips	Already exported
4	PED	4 years	West Java	Healthy Drink	Already exported
5	SSG	3 years	West Java	Premium Tea Leaf	Already exported
6	MMZ	10 years	West Java	Frozen Food	Not export yet
7	BKM	5 years	East Java	Brownies Chips	Already exported
8	ADK	3 years	East Java	Spices	Already exported
9	AZH	2 years	East Java	Frozen Food	Not export yet
10	BF	8 years	East Java	Processed Fish	Already exported
11	MK	4 years	North Sumatera	Healthy Floss	Already exported
12	BM	5 years	North Sumatera	Meatballs	Not export yet
13	DD	6 years	North Sumatera	Packaged Rendang	Not export yet
14	RJQ	8 years	North Sumatera	Crispy Mushroom	Not export yet
15	BA	5 years	Banten	Coconut Root Cake	Already export
16	KP	4 years	Banten	Bitter Melon Chips	Not export yet

Source: Authors own research

(a) Data management: Data familiarization process through reading the data, identifying categories, developing a coding matrix, and allocation of categories into coding matrix.
(b) Descriptive accounts: Summarizing and synthesizing coded data using content analysis approach (Hsieh & Shannon, 2005), identify patterns and create 'whole picture' of the data. This process is done manually on an Excel sheet. We decided to use this method since we cannot optimize the categorization process using another tool, such as NVivo, which is unable to read and categorize transcripts in Indonesian.
(c) Explanatory accounts: Developing patterns with specific categories while reflecting on the original data and the data analysis stages to check data accuracy and minimize misinterpretation. In this stage, it is very critical to correctly interpret and find explanations or meanings from the participants' information to generate high quality research results.

Interviewees' consents were asked in the beginning of the interview and the data gathered in this study were based on interviewees' consent knowing that their knowledge and information will be used for research accordingly.

4 Results and Discussion

4.1 Attitude

Result shows that despite the businesses having different ages and products, attitude towards internationalization plays a major role in influencing the owners to finally export or at least prepare all the necessary steps for entering the international market. First dimension of EO, autonomy, has three belief statements which is independent action, new insight, and freedom. 6 out of 16 owners doing their own market research and taking steps to enter a new international market shows their willingness to take independent action when they see opportunities.

> Due to pandemic, not many products sold well in domestic market so we start looking for another way in international market—BF

4 out of 16 participants mention they received new insights during the preparation process to export by seeking new opportunities, checking their business readiness, and also unexplored potential of their business.

> …We joined a training about export before so far it's okay but then we find that for a whole container we are not capable yet because of our limited raw material…—SSG

While 6 out of 16 participants agree that freedom has the most impact because as an entrepreneur, they have freedom to change business direction and strategy to understand further whether pursuing international markets will be profitable for their business or not.

> …We have unlimited freedom whether we want to export or not based on our capacity…—DD

As an entrepreneur, the decision to enter the international market is an act of responding to the situation to maintain business continuity. The decision must be made automatically by the entrepreneur concerned because it is related to the risk of a lack of knowledge about the competitive environment in the destination country (Zhou et al., 2010) and the resources they have to create competitive advantages (Sanyal et al., 2020).

Second dimension of EO, proactiveness, also has three belief statements which seek opportunities, first mover, and bias for action. 9 out of 16 participants mentioned several ways of seeking opportunities such as joining exhibitions which are not just to understand market demand but also to meet potential buyers.

> I once joined an exhibition in Malaysia and Thailand before the pandemic and the response for my product in another country is really good… I can see market opportunities for my product…—BNC

Other ways to seek opportunities mentioned are to interact with followers on social media to understand market demand and join government institutions to gain more facilities and knowledge regarding export.

> …We share it on Whatsapp Group or Instagram where we can see what is the dominant product based on what our customers like…—ADK

Research about the country's market demand, certification, and regulation are the participants' bias for action despite having little or no buyer at the moment reach out to them that were mentioned by 6 out of 16 participants.

> …For the past 3 years we keep sending proposals to buyers all over the world…—BF

Only 2 out of 16 participants mentioned being first mover as the owner keeps looking for a way to introduce a new product that is not noticed yet by other competitors.

> If the product based on persimmon, no other companies use this as their main ingredient moreover to export, only us—PED

Third dimension of EO, innovativeness, consists of three belief statements which are R&D investment, new tech, and new products & services. 4 out of 16 participants do have an effort in R&D investment to research not just limited to potential new markets but also potential business growth in the future. Through R&D investment, owners are capable of choosing the next right step based on data.

> …I always have a research team to think about what product to create next to expand my market…—MMZ

11 out of 16 participants mentioned new products and services in a lot of ways such as creating new variants based on market demand, upgrading the packaging, and increasing service while ensuring high quality product standard. Reasoning behind new product and services also varies, some participants said giving more variants so customers will have more choices to choose from while others focusing on

competing against competitors with the same product by giving different value than what competitors already offer.

> …In the future we will add tea bags to help customers brew tea easier… Still innovating to make things easier for the customer in terms of packaging and serving method…—SSG

So far, no participants' answers related to new technology indicate that the owners might have no idea how to develop new technology to increase their innovativeness or it is not necessary to upgrade any new technology towards the product that they sell.

Fourth dimension of EO, competitive aggressiveness, consists of staying up-to-date, responsive towards competitors and market changes, and competition improves productivity. 3 out of 16 participants mention how they stay up-to-date with the current international situation such as war or pandemic that influence their action and intention towards internationalization.

> …There are major changes during COVID, our resellers down from 187 to 40… Our international sales helped a lot although it was only around 200–500 pieces but we send it weekly…—BKM

8 out of 16 participants' answers were more about how they respond towards market needs and/or competitor movement in the international market. Most participants even mentioned the detail of their process to adjust towards market demands.

> A lot of people like it and give suggestions like adding cheese for kids… Finally, due to many demands and many kids also enjoy our product, we will add cheese flavor next—BA

5 out of 16 participants believe that having competition helps them in understanding the international market and give them insights on how to be better than the already existing competitors.

> …Competitors are important to see how big our brand is and also judge how well are we doing in the market… We learn how they can be like that or on a certain level…—KTC

Fifth dimension of EO, risk taking, consists of taking chances, taking bold actions, and financial risks. When asked about the SMEs that have already exported, 8 out of 16 participants acknowledge that there is a financial risk that comes during the export process. However, some of them mention several ways of how they manage the financial risk such as ensuring the buyer paid for all the export expenses, buyer paid for the product fully before export to the buyer's country, or join government programs that export along with several other SMEs brands.

> …Our product packaging got damaged when it arrived and the buyer complained about it. The buyer doesn't want to consider it as their loss so I told him that it's a sample for him…—SSG

All of the participants also agree that taking chances and taking bold actions are necessary to export or in general to achieve their business goals. 3 out of 16 participants did face a failure regarding export but using that experience as a lesson in the future because it is undeniable that one way or another, the owners will encounter risky circumstances.

> …We have a problem with one distributor so we have an excess of products. We thought about what to do with the excess product and the answer is export…—BNC

The result shows that attitude plays a major role in influencing the owners regarding internationalization intention because the owners are actively searching and discovering how their product can enter the international market. The interview also revealed that what product they sell has a significant impact on their internationalization intention. For example, dry products tend to have an easier process to enter the international market so most SMEs with dry products are already exported due to the product type that has a long expiration date and is easy to carry. However, it does not stop SMEs with products other than dry to enter the international market as these SMEs are looking for a way to innovate their product so it can be exported as well as processing the certification needed to enter certain countries. Our results also align with Dadzie et al. (2020) that entrepreneurial orientation can positively impact SMEs' internationalization.

4.2 Subjective Norm

Subjective norm refers to how much external social factors such as family, friends, or institutions have an influence towards the owner's internationalization intention. First concept is regarding normative beliefs that only result from social interaction which in this case we asked the participants whether their internationalization intention was influenced by someone they have an interaction with. 14 out of 16 participants answered that their internationalization intention is indeed heavily influenced by other people they have interacted with that shows interest towards their product which makes the owners realize their product export potential. Others received support and positive feedback from SMEs association groups and mentoring groups that are connected to the second concept.

> …Institutions like the Ministry of Trade help a lot and now the government officially announces Sarinah as a SMEs basecamp where many international buyers can directly transact with SMEs there…—SSG

Despite most of the owners agree that there is an influence from interacting with others, there are two participants that explicitly explaining there is no influence of internationalization intention because they are not ready to export yet and the internationalization intention at the very beginning start from within themselves.

Second concept stated that normative beliefs can only influence behavior when it comes from a close referent group. In this case we asked the participants if there any family members or friend groups that already exported which also influenced their intention to start exporting as well. All of the participants agreed that friend groups such as SMEs association and community really helped them in terms of finding information and knowledge necessary about exporting and become a motivation for them that haven't export yet. Mentoring groups and programs under government institutions for SMEs are also very impactful towards their internationalization

intention because these government institutions not just give information and knowledge but also other facilities necessary to enter the international market such as easier access to create certification and find buyers.

> (In 2019) finally we learn about export and join Export Center Surabaya. After we join there, we get a lot of knowledge… In 2020, we already focus on international market oriented…—BKM

Third concept stated normative beliefs only influence behavior in ambiguous situations in which individuals are known to only do certain behavior if they can refer to someone if they are unsure about a certain situation. We asked the participants if there is anyone that they refer to in terms of entering the international market. Most of their answers are similar to previous concepts which are mentors and government institutions. It is understandable that the owners perceive government institution and mentors within that program as reference because government institution providing knowledge and facilities which give opportunities for SMES to get easier certification process send samples to potential buyers or other countries embassy, and join international exhibition with many potential buyers coming. All of these facilities given by government institutions increase the chance of gaining buyers and also SMEs' product exposure at international level which cannot be obtained if the SMEs try to enter the international market alone because it will be too heavy on the SMEs in terms of financial capital.

> There is also (reference) from a mentor. Our mentor is in PPEI, Pusat Pelatihan Ekspor Indonesia (Indonesia Export Training Center). They are coaches, mentors, and also entrepreneurs…—BNC

The fourth concept states normative beliefs only influence public behaviors, which means that internationalization intention might not come from within the individual but is based on others' perceptions towards the owners. We asked if entering the international market was their pure intention from the beginning of starting the business or if there was anything else that influenced them to finally consider internationalization as their next step. There are three main answers to this question. The first type of answer is that 4 out of 16 participants have yet to target internationalization at all due to their perspective that entering the international market is too complicated, the domestic market is still profitable, or the current product does not fit to export.

> From the beginning I have had this view that export is something that is a little complicated… I just want to hold domestic market share—DD

Second type is 7 out of 16 participants who have already aimed for internationalization since the start of their business.

> It is our vision and mission to export—RJQ

Third type mentions that there is an external factor that forces them to take internationalization such as product suits other country's markets more than domestic, lower profit due to pandemic, or export opportunity that emerges which in that situation the owners can utilize. 5 out of 16 participants mention this point.

> We see that during pandemic our main products did not sell well in local market so we start looking for international market—BF

Fifth concept stated people know when they have been influenced by normative information which in this research context would like to reveal whether the owners are aware of the internationalization influence that they might have received from other SMEs within the same industry and whether that also has any impact towards their intention to enter the international market. There are also 3 types of answers coming from the participants. First, 9 out 16 participants answered they are aware of other SMEs but it does not give much impact towards their internationalization intention.

> …From the packaging design, we are better than our competitors. For the product itself, we are also better because I often win competitions in my area…—KP

Second type which is mentioned by 3 out of 16 participants said that they are aware and also motivated by other SMEs

> Of course, I am very motivated (by other competitors) because my knowledge is not that deep yet. (Through competitors) we also can predict whether our product will be able to compete in the international market or not…—MMZ

Third type, which consisted of 4 out of 16 participants, said that there are no other SMEs with similar products. This is the reason why they receive no influence from other SMEs

> …But the one with the same product type as mine so far I do not see other SMEs…—BM

Second foundation of the subjective norm, which is motivation to comply, is to try to understand and measure to which extent the individual cares about other people's opinions. The first question we asked regarding how the owner's surroundings reacted towards their intention or action to enter the international market. All of the participants answered that their surroundings as friends, families, and even institutions give their full support and help in any ways they can, which indicated that one of the reasons the business can run for a long time is the existence of support from the surrounding environment.

> For now, government institutions are so supportive and we have a lot of raw material here. Also, because I joined a community for entrepreneurs that already export, everyone supports one another—YB

Second question we asked was whether entering the international market is a sign of success for the owners. 4 out of 16 participants answered yes because entering the international market has more meaning to it. It means the business already has a high standard product and quality, it also shows how good the product is because through export it means the product is widely accepted, and broadening the business market share outside of the domestic market.

> …Sometimes we want to have this sense of pride in our business and if we can export that can boost our pride and brand image as well…—MMZ

12 out of 16 participants that answered no said the reason is that export is just a business strategy to achieve success not the success itself. They also mentioned how there are more ways to succeed depending on the product and in which market that product suits more.

> …(Export) It is only a choice and I think either the domestic or international market is the same. Success is about how to maintain sustainability of this business… So, it is not a parameter of success or not—BNC

Last but not least, the third question we asked about their perception towards themselves if compared to other business owners. This question is personal with a variety of answers. However, we can understand the personality of each business owner to see what their potential next step regarding internationalization is. 11 out of 16 participants said they are a learner who still needs to learn about a lot of things about export which indicates these owners are risk averse type of entrepreneurs because they want to make sure they know everything and ready to face any possible export challenges in the future.

> …If compared to other entrepreneurs, we are still relatively young. Although I understand banking and financing, we have sharing sessions with others to learn from each other…—DD

There is a more risk taker type of entrepreneur based on answers by 5 out of 16 participants that mentioned how they pursue the international market because they love challenges, a leader in the industry, and have no choice but to actively look for export opportunities because they really want to export.

> I am a person who loves challenges and never satisfied with myself because competitors are getting smarter so we need to keep thinking of new ways so our product will be accepted by the customers…—BM

Although there are similarities between answers, it cannot be denied that subjective norms are still very much based on each individual's perspective. The owners' experience, knowledge, perception, product, and market suitability play a major role to shape each owner's subjective norms towards internationalization intention. However, it is also confirmed that support from surrounding facilities, information, and knowledge given by government institutions also have a significant impact to create a positive subjective norm perspective towards internationalization intention by the owners. It also indicates that the government has an essential role in increasing the intentions of SMEs and accelerating the penetration of SMEs in the international market. Even though, in the beginning, entrepreneurs did not intend to go global because they were pretty satisfied with the performance of the domestic market and worried about

the complexity that would be faced, the government could raise their awareness and interest in committing to the international market (Czinkota & Ronkainen, 2007). Government support can increase knowledge, reduce international market risks, and open doors to foreign markets (Zain & Ng, 2006). On the other hand, the government has an interest in increasing the involvement of SMEs in the government market related to increasing foreign exchange for the country (Wiryanti, 2017).

4.3 Perceived Behavioral Control

Perceived behavioral control means to understand the owners' perception of the ease or difficulty of export that throughout the whole interview can be seen and concluded. Not just concluded from the interview as a whole we also asked two questions, the first question regarding who acts as the exclusive decision maker within the SMEs. All of the participants answered that as the owner, they have the absolute power to decide anything within their company. Although some still include discussion with their partner or team members, the final call for decisions are taken by the owners. Thus, indicating the validity of this research to interview the owner because internationalization intention can be seen only from the owner as the representative of the whole company.

> For decisions me and husband usually talk it out first but the final decision is on me—KP

The owners are the one who give judgment over the ease or difficulty of entering the international market which is related to the second question. Second question asked about the readiness of the SMEs as a whole to enter the international market and what is the reason behind whether the owner perceived that their business is ready or not for the international market. Some that are already exported show that they are ready to face any uncontrollable export risk such as problems in product shipment or product damage during delivery. More things to focus on for SMEs that are already exported are increasing the quantity of production, maintaining SOP and high-quality standard products, and adjusting with the other country's market demand. As for SMEs that have not exported yet, they face challenges to enter the international market such as insufficient financial capital, incomplete certification, and low number of daily productions that cannot fulfill the export needs. This result is align with the study of Sommer (2010) that once the entrepreneurs can qualify the feasibility and capability they can decide whether they want to commit or not for international activity (Table 3).

Table 3 SMEs Owners' Indication of Internationalization Intention

Construct	Variables		SMEs Owners' Indication of Internationalization Intention
Attitude	Autonomy	Independent action	International market as target and conduct market research
		New insight	Market research gives new information on opportunities, check business readiness, and unlock growth potential
		Freedom	Freedom to observe and choose international market depends on business needs
	Proactiveness	Seek opportunities	Join exhibitions, government institution or interact with followers
		First mover	Explore untapped potential market and industry
		Bias for action	Research international market's demand, certification, and regulation research despite no export opportunity yet
	Innovativeness	R&D investment	Research potential new market and product growth
		New tech	None
		New products and service	Create new variants based on market demand, release new packaging, give better services while ensuring high quality product standard
	Competitive Aggressiveness	Up-to-date	Pay attention to international situations that might affect export (E.g. war and pandemic)
		Responsive	Adjust product based on market demand and give competitive value
		Competition boost productivity	Use competitors as benchmark to observe what market needs and create differentiator with others
	Risk-taking	Take chances	Send samples to interested buyers to increase the chance of export deals
		Take bold actions	Proceed to pursue international market despite disadvantaged international situation
		Financial risk	Might not end in an export deals after send samples

(continued)

Table 3 (continued)

Construct	Variables	SMEs Owners' Indication of Internationalization Intention
Subjective Norm	Social interaction	Receive encouragement and positive support after interacting with an individual/group that sparks the owners' interest in international market
	Close referent group	Close friends and family members already export also influence positive intention towards internationalization
	Ambiguous situation	Refer to a group or individual with international market knowledge as the main source of information
	Public behaviors	Might have international market as initial business target from the beginning or utilizing opportunity that comes as the business continues to grow
	Aware of being influenced	Only perceived other SMEs as motivation to enter international market
	Care about others' opinion	Supportive surroundings International market as a sign of success International market as a necessary business strategy
Perceived Behavioral Control	Ease or difficult perception	Owner in full control to enter international market or not based on their business readiness Other factors may affect such as product type or certification

Source: Authors own research

5 Conclusions

Three constructs within the Theory of Planned Behavior that have been modified to suit the entrepreneurship context in this research revealed that the owners' attitude plays a major role in influencing internationalization intention. It indicates that solid internationalization intention comes from within the individual who sees export as a profitable and/or sustainable way to run their business. Despite many other factors that influence the owners' decision regarding entering the international market, the intention itself to head their business direction towards internationalization is still firm. It is proven in both situations of SMEs, whether exported or not, that they keep making efforts towards internationalization.

In the situation of SMEs that have not exported yet, the most common challenges they face are that product is not suitable for export, no buyer is interested yet, lack of information about other possible ways to export their product, production quantity is not enough to fulfill international market demand, lengthy and complicated

process of certification to enter certain countries with a particular regulation. Regardless of all those circumstances, the effort to enter the international market is still evident, which indicates their strong and positive attitude towards internationalization. The effort that proves their internationalization intention includes joining a friend group or SMEs association where many other SMEs have already exported so they can learn and obtain export information. Many SMEs also undertake certification and regulation processes to prepare themselves for upcoming export opportunities.

As for SMEs that have already exported, their success in exporting their product is a testament to their internationalization intention. Without strong internationalization intention, then there will be no internationalization behavior. However, these SMEs still need to overcome common challenges such as small quantities available to export, very dependent on government institutions in terms of facilities and export opportunities, and lack of financial funding to be capable of exporting on their own. It means that even though SMEs have already exported, there is still a long way for these SMEs to support and make a name for themselves in the international market.

This paper manages to give theoretical contributions by researching on a new area using Theory of Planned Behavior and generate deeper understanding of internationalization behavior from SMEs owners' perspective. As for the practical contributions, there are several recommendations and insights that can be taken for stakeholders such as SMEs owners and government. For SMEs owners, this study can be the foundation and guideline to measure their readiness and preparation to enter international market. This study can also be used to see which part in their business that needs improvement or addition. As for government, this study can be used to see how they can support SMEs and what important key points to focus on to increase internationalization intention which eventually will affect the number of export from SMEs.

However, there are limitations on this study such as only focused on one industry in SMEs, scope area limited only on Indonesia, and only use qualitative method. Many different approaches and perspectives can be taken to explore the topic while using this research as a guide to understanding internationalization intentions on a much deeper level. For example, using different research method and covering different scope.

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Entrepreneurial Seniors. Inspiring Initiatives in Spain, Finland, Slovakia and Portugal



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Abstract Social entrepreneurship among older people is of great importance given the ageing of the population and the need to promote active ageing through the creation of enterprises. The main objective of this study is to analyse the main aspects taken into account by older people who have undertaken social entrepreneurship in the field of social economy. Specifically, semi-structured interviews were conducted with four senior entrepreneurs in Spain, Slovakia, Finland and Portugal. The enterprises belong to different areas: livestock, construction, home care, handicrafts, but with the common link of representing good examples in the field of social economy since part of the profits are invested in the local community to ensure the sustainability of the project and the development of the area. The results show the motivations, needs, threats and strengths of senior entrepreneurs, as well as the strategies that have been established to face the general impact that the crisis caused by the Covid-19 pandemic has had on senior businesses.

Keywords Senior entrepreneurship · Social economy · Older entrepreneurs · Endogenous resources · Silver economy · Local communities

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1 Introduction

Demographic projections indicate that Europe is and will remain the most ageing continent in the world. By 2030, the population over the age of 60 is expected to reach 119 million people, an increase of 59% between 2015 and 2030 (Huenchuan, 2018). The increase in the population pool of older people has generated an undercurrent against this human group. The image that has been created of the elderly is that they are inactive and consumers of public resources and services, i.e. they are seen as a disruptive element for present and future social welfare.

However, other voices are also being raised to vindicate the figure of the elderly for their relevant contribution in the form of work. Indeed, situations of dependency or deprivation associated with the elderly are transformed into business and economic activity. The *silver economy* represents 25% of European GDP (Geriatricarea, 2020).

This growing population of healthy older people has the skills, financial resources and time available to contribute to economic activity by extending their working lives, including through entrepreneurship. Senior entrepreneurship is bursting onto the scene in recent years. The highest rate of entrepreneurship worldwide has shifted to the 55–64 age group. In the United States, according to the Global Entrepreneurship Monitor (Hill et al., 2021), people over the age of 50 are almost twice as likely to start successful businesses as those aged 20–34.

Promoting entrepreneurship among older age segments is a prospective educational option to prolong the working lives of older people and reduce unemployment in old age. Moreover, engaging in social entrepreneurship through economic activity generates economic wealth and social enrichment (Ortega-Gutiérrez et al., 2021). To all this we must add the main motivation of older people for entrepreneurship: the need to obtain an income that the labour market denies them (Puyol et al., 2021), the desire for autonomy and the use of skills and knowledge acquired throughout life (Hess & Rothlauf, 2018). Also, senior social entrepreneurship is a form of active ageing as it provides physical and psychological health to entrepreneurs (Padilla Góngora et al., 2017). Entrepreneurship, therefore, is part of the strategy to enjoy healthy ageing.

Although age studies are booming, so far, academia has not exploited the potential of senior social entrepreneurship. However, we found some works that allow us to know the topics that generate more interest in the academic world (Díaz-García et al., 2019; Calvo-García et al., 2020). Special attention has been paid to the motives that older people have for entrepreneurship, the facilitating factors and the barriers that have been encountered in the process. In addition, Felstead et al. (2019) develop a typology of older entrepreneurs. Four types of senior entrepreneurs are identified: “traditional entrepreneurs”, “late entrepreneurs”, “occasional entrepreneurs” and “necessity entrepreneurs”.

Empirical studies examining the relationship between entrepreneurship and active ageing have also been conducted in European countries (Bárcenas et al., 2021). Individual and contextual factors that influence older people’s participation

in entrepreneurial activities are identified. The European continent, the geographical space where our research is framed, has become a recurrent place for this type of studies. Hess and Rothlauf (2018) carry out exploratory work examining senior entrepreneurship in Germany. And Nikolaev and Bennett (2018) focus on the UK to analyse the motivations, constraints and outcomes of entrepreneurship in older people.

As mentioned above, academic studies on older entrepreneurship in the social economy allow us to recognise the entrepreneurial potential of older people, boost their active economic participation, challenge negative stereotypes and generate valuable knowledge. Moreover, fostering entrepreneurship in this demographic group has a significant social and economic impact, promoting job creation, social cohesion and improved quality of life. Therefore, research on entrepreneurship among older people in the field of social economy is essential to take full advantage of the benefits that this entails.

All of the above arguments have prompted this study, which aims to analyse cases of senior entrepreneurship in the framework of the European Union. Four relevant examples of entrepreneurship in Spain, Slovakia, Portugal and Finland, the four countries that are part of the Erasmus+ Social Senior Entrepreneurship project, have been taken as a sample. Specifically, this study has described the profile of senior entrepreneurs, the process of creating the company and its start-up. It has also analysed the management strategies carried out by the entrepreneurs during the health crisis caused by COVID-19. The aforementioned objectives were achieved by means of a semi-structured interview, a qualitative method that facilitates nuances that only this methodological tool allows us to discover.

2 Social Economy and Senior Entrepreneurship

Today, social entrepreneurship can be interpreted as a growing phenomenon in different contexts (Defourny & Nyssens, 2017). However, social enterprises have a long historical background. The term social economy first appeared in economic literature in the early part of the nineteenth century. In this year, the French liberal economist Charles Dunoyer (1830) published a treatise on social economics in which he advocated a moral approach to economics. Apart from the conceptual tensions and debates, which are dealt with in various scientific articles (Peredo & McLean, 2020), the social economy is characterised by the principle of solidarity, while its main function is to fulfil social and societal objectives. For example, it aims to benefit as many people as possible who are in a situation of passive social dependency, indicators of the risk of poverty and social exclusion.

Social Economy Europe in its report "Social Economy. A business model for Europe's future" (Milotay, 2020) links the social economy mainly to issues such as support for increased employment, solidarity, reinvestment of profits for the development of public services and regional development. The social economy is made up of enterprises of all sizes, although micro, small and medium-sized entities

predominate (Mair et al., 2019; Nicholls et al., 2018). The social economy ecosystem is also characterised by a diversity of enterprises and organisations, such as cooperatives, associations, foundations and for-profit enterprises (Borzaga & Santuari, 2018).

With regard to social entrepreneurship, there are several definitions of the term. One of them is the one proposed by Muhammad Yunus (2011), who coined the following definition: unlike traditional enterprises, a social enterprise operates for the benefit of meeting social needs that enable communities to function more efficiently. Social enterprises provide a necessary framework for addressing social problems by combining business expertise with a desire to improve the quality of life.

Social enterprises thus aim to solve old problems (economic inequality, environmental exploitation, etc.) with a new approach. Social enterprise is conceived as the fusion of the business approach (bringing products and services to the end consumer and generating profits to reinvest and continue to grow) and non-profit organisations (which aim for social welfare, seeking to understand the problem in order to eradicate it) (Del Cerro, 2016).

Studies on the motivations of social entrepreneurs show that in business creation, entrepreneurs prioritise social impact over economic impact (McLaughlin et al., 2022; Samuelsson & Witell, 2022). In this line of thought, Del Cerro (2016) states that "social entrepreneurs are people who seek to solve the most pressing social or environmental problems in an innovative way and with a high systemic impact approach". Social innovation as a keyword has been increasingly used in policy to promote new solutions to social challenges.

In the field of social innovation, from an ageist perspective, population ageing has been seen as an obstacle to the development of new models. However, population ageing can be perceived as a dynamic driver for social innovations that address growing needs for new products or services. According to Jessica Lee (2017), entrepreneurship drives economic growth regardless of the age of the people involved.

From a political and economic perspective, senior entrepreneurship seems to be the answer to the ageing and increasing life expectancy of the population in Europe. Senior entrepreneurship seems to represent an undisclosed potential for economic prosperity for this age group (Stypińska et al., 2019). Several European Union (EU) and Organisation for Economic Co-operation and Development (OECD) policies and strategies promote entrepreneurship among older people by creating environments and frameworks. For example, the EU Stockholm plans, the Europe 2020 strategy, the European Year of Active Ageing and Solidarity between Generations are strategic proposals that suggest prolonging working careers and thus increasing older people's participation in paid employment.

The senior entrepreneur is, on the other hand, confronted with the ideal Schumpeterian entrepreneur, i.e., a young, preferably male, often white, dynamic, innovative, risk-taker and opportunity-taker, who is fully responsible for his or her success and failure. Senior entrepreneurship contributes to the creation of new and innovative solutions to unemployment, underemployment, social exclusion or poverty (Stypińska et al., 2019). Older entrepreneurs orient their activity in the form of social entrepreneurship.

Some studies have revealed specific advantages of senior entrepreneurship (Lapiedra & Cardona, 2021), compared to that of younger people:

– Work and industrial experience;
– More developed social networks;
– Increased technical and management capacity;
– Transmission of knowledge;
– Stronger financial position;
– Social innovation.

However, despite the advantages associated with senior entrepreneurship, age stereotypes can limit access to seed capital, start-up grants or subsidies. This type of prejudice proves unjustified since, as the study by Gimmon et al. (2018) points out that older people can be successful entrepreneurs in a safe environment, rather than being discriminated against on the basis of their age.

The activities of the senior entrepreneur often take place in the field of social innovations, specifically addressing the needs of older people, and can benefit from the seriousness and "speaking the same language" as older clients. Business incubators for older people, as organisations or as projects addressing unemployment, risk of poverty and social isolation of older people, are innovative ways of addressing these challenges and have the potential to become social innovations that deserve to be disseminated. The EU was among the first organisations to create policy initiatives aimed at stimulating entrepreneurship among older people (Pilkova et al., 2014).

In Ireland and Poland, countries that are centres of social economy models along with Slovakia, Sweden and Belarus (Stukalo et al., 2022), there are some entrepreneurial initiatives for older people. In Ireland there is the SeniorEnterprise. This is an initiative supported by the European Union through INTERREG IVB NWE, specifically designed to encourage greater participation in entrepreneurship by people over 50. Three initiatives have been launched in Poland: "Senior Business Incubator", "Pomeranian Design Factory" and "Senior Entrepreneurship Initiative" (Stypińska et al., 2019). From the three mentioned above we highlight the "Senior Entrepreneurship Initiative" which was implemented by the Gdynia Economic Foundation in cooperation with the Poviat Labour Office. The main objective of this project was to develop and test a model of pre-incubation of economically active people over 50, aimed at activating them to start their own business. The effectiveness of the pre-incubation model was demonstrated by its high efficiency (52%), as out of the 60 people who completed the project, 21 got a job, five created a company and five a social cooperative. The results of these projects demonstrate that senior entrepreneurship is a safe investment to create social welfare and wealth. This thesis reinforces the objectives that have been proposed in this research.

3 Objectives

The general objective of this research is to highlight relevant cases of senior entrepreneurs in order to raise awareness in society about the importance of social enterprises and older people.

To this end, the specific objectives are:

- To detail the process of setting up, running and managing a social enterprise created by older people.
- Identify the challenges and difficulties in setting up a senior social enterprise and how they have been addressed.
- To show how the COVID-19 health crisis has influenced the company's operations and how this situation has been managed.
- Drawing a profile of senior.

4 Methodology

This research is based on a qualitative methodological approach. According to Strauss and Corbin (1998), qualitative research is understood as "any type of research that produces findings that are not arrived at by means of statistical procedures or other means of quantification". The qualitative method has been chosen primarily because of the nature of the research problem: to learn about the experience of entrepreneurship carried out by older people in adulthood.

Case studies have been used to carry out the qualitative analysis. This design is defined as "studies that use quantitative, qualitative or mixed research processes to deeply analyse a holistic unit in order to respond to the problem statement, test hypotheses and develop some theory" (Hernández Sampieri & Mendoza, 2008). The case study is a method that allows to explain, in a comprehensive way, how the experience has developed and to interpret the why of the facts (Simons, 2011). Furthermore, the flexibility of the case study (less time-consuming and less constrained by the method) has facilitated the development of a study involving actors from four European countries.

Although the results of the case study do not allow for generalisations, cross-case analysis allows us to study initiatives in different contexts to see what general propositions can be deduced. Cross-case analysis leads to generalisation through recognition of similarities and differences. Following the postulates of Goetz and LeCompte (1988), the selection of cases was based on the search for reputable, unique and comparable examples, as well as the selection of people who were willing to narrate their experience.

How were the cases selected? The selection of the sample was carried out by experts in social economy and entrepreneurship from each of the countries that were part of the consortium for the development of the Erasmus+ Senior Social Entrepreneurship project: University of Malaga, QUALED (Slovakia), Universidade

Sénior de Évora (Portugal) and University of Applied Sciences Turku—TUAS (Finland). Each entity has carried out a screening of relevant senior entrepreneurs and, through their networks of experts, the entrepreneurs were contacted. Subsequently, one good example from each of the European countries forming the consortium was selected for the case studies. The sample was limited to the following entrepreneurs:

- Chelo Gámez (Spain). Retired professor of economics and entrepreneur in the gourmet Iberian products sector (La Dehesa de los Monteros).
- Vladimír Ledcký (Slovakia). Employer in the construction sector who employs Roma people to facilitate their social integration (Hrhovské služby).
- Eila Kaijärvi Pekkola (Finland). Entrepreneur in the elderly care sector and employer of seniors (Senioriosaajat Limited Company).
- Nuno Rosa Dias (Portugal). Entrepreneur and creator of a business based on Portuguese art and popular tradition (O Homem Almofada).

The main instrument for gathering information and gaining knowledge and understanding of the cases has been the semi-structured in-depth interview. For Hernández-Sampieri et al. (2014) "Semi-structured interviews are based on a guide of topics or questions and the interviewer is free to introduce additional questions to clarify concepts or obtain more information". The interview is one of the main methods used in the case studies, as it is a technique with great potential to obtain information orally, in a personalised and in-depth manner.

The interviews were conducted in the months of February to November 2021. The procedure for carrying out the interviews was as follows: selection of the entrepreneur, research and documentation on the entrepreneur and the company; conducting a preliminary interview with the protagonist to verify the information and design the questionnaire; conducting and recording the audio interview; transcription of the interview with specific software; analysis and categorisation of the text in relation to the research objectives.

The elaboration of the questionnaire has been carried out by drawing on the experience and expertise of the experts in entrepreneurship and social economy who have collaborated in the Social Senior Entrepreneurship project. The following research questions were posed to the senior entrepreneurs:

1. Definition of the company
2. How would you describe the process of setting up your company?
3. What is the competitive advantage that motivated your business idea?
4. What challenge or threat did you encounter in the development of your project, especially in the initial or early stages? And how did you manage to overcome them?
5. What support have you received from public administrations for the creation of the company, both financially and in terms of mentoring?

This methodological approach guaranteed the objectives set out in the research, which have been materialised through the results shown in the following section.

5 Results

5.1 Entrepreneurship and Motivation

Chelo Gámez (Spain) is a retired professor of Macroeconomics at the University of Málaga. In 2008 she created La Dehesa de los Monteros. This company is focused on the breeding of 100% Iberian pigs and the production of high-end ham and sausages. La Dehesa de los Monteros is a family business, of which Chelo's three children are now part: one as commercial director, another as marketing and advertising director and the other as director of administration and computerisation of the company. La Dehesa de los Monteros is a company based on some fundamental principles of the social economy. The profit is not only for the owners or shareholders of the company, but also for the welfare of the workers and other partners.

Vladimir Ledecký (Slovakia) in 2005 founded Hrhovské služby, a municipal social enterprise in the construction sector in Spišský Hrhov. The company was established on the basis of a development and entrepreneurship programme when Vladimir was mayor of Spišský Hrhov. The aim of this venture was to provide employment and social integration for members of the Roma ethnic group living in the town. Other self-governments in Slovakia were inspired by this entrepreneurial initiative. From that moment on, the idea of institutionalising social entrepreneurship developed and the law on social entrepreneurship in Slovakia was created.

Eila Kaijärvi-Pekkola (Finland). Retired financial management professional active in associations. In 2010 Eila Kaijärvi-Pekkola founded Senioriosaajat Limited Company. The company operates in Rautalampi, Eastern Finland. The company offers a wide range of home help, renovation and expertise services. The services are provided by retired people, to whom the work in the company gives the opportunity to participate in working life according to their own abilities. The creation of participation and employment opportunities for older people was one of the key factors that motivated Kaijärvi-Pekkola to start up.

Nuno Rosa Dias (Portugal). The Portuguese entrepreneur created a business based on art and tradition. Nuno Rosa Dias started the activity as a hobby. He made cushions for decoration with Arraiolos stitch embroidery. In August 2020 he sold the first cushion. From this moment on Nuno considered that he could start a business related to traditional Portuguese handicrafts and founded "O Homem Almofada".

5.2 Process of Creation and Competitive Advantage of the Company

To create La Dehesa de los Monteros, Chelo Gámez was advised by experts from the University of Córdoba. The first step taken by the Malaga businesswoman was to select the Iberian breed. To do so, she carried out a study of the Iberian breeding

companies, the organoleptic characteristics of each breed and decided on the Retinta breed. The commercial strategy that governs the enterprise of this company is the differentiation of its product. It differentiates itself from the rest by the purity of the breed of pig, by the breeding of the animal and by the type of feed, based on the intake of chestnuts allowed to graze free-range. Differentiation is the main competitive advantage of La Dehesa de los Monteros. For Chelo, differentiation was the only way to compete with low production in a market as mature as the Iberian market.

Eila Kaijärvi-Pekkola decided to found Senioriosaajat Ky after she had been retired for 2 years. She wanted to develop useful and fulfilling activities for herself, but also for other retired people. She became interested in the Finnish labour market situation and especially in the position of older workers in the labour market. When Senioriosaajat Ky was founded in 2010, there were almost 1.4 million retired people in Finland. They formed a large labour resource that was hardly used—this was the competitive advantage of his company. "The main reasons that led me to set up my own business were to create an opportunity for retired people who become employees of my company to act as useful and active members of society and, at the same time, to provide them with pleasure and vitality for the retirement years, as well as an additional income to their small pensions" (Kaijärvi-Pekkola, personal communication, 23 March 2021).

Hrhovské služby was established by Vladimir Ledecký as part of a development plan for the Slovak town of Spišský Hrhov. One of the main focuses was to address the problem of unemployment among the Roma population and the negative problems associated with this excluded community. To solve this problem Vladimir, who was the mayor of the town at that time, set up a municipal company. Another aspect that the venture aimed to address was to curb the outflow of villagers to other regions for work. The advantage of the Slovak initiative was the possession of land and the possibility of marketing some of it. There were periods when more than 100 workers were employed and more than 500 plots were built at affordable prices, so that people from the region also started to move to the village.

In the case of Nuno Dias, what started as a hobby, materialised into a company ("O Homem Almofada") that currently has the brand created and registered in Portugal. "Gradually I started to consider whether I shouldn't take this project more seriously and in September 2020 talking to an American friend who lives in Lisbon and worked in art in Los Angeles, he told me that he loved my cushions, that the patterns and colours were very beautiful and that he could sell them. That same day I decided to create a social media profile for the project and in 5 min I invented "Mr. Cushion" (Nuno Dias, personal communication, 10 May 2021).

5.3 Challenges, Difficulties and Solutions in Setting Up a Senior Social Enterprise

In the Spanish case, the main challenge faced by Chelo Gámez was to create a product based on differences. Innovations generated mistrust in a market as immobile as the Iberian pork market. On a personal level, the management of an agricultural company, in an eminently untrained and somewhat traditional and male chauvinist sector, caused the senior entrepreneur entry difficulties because she was a woman who was not from the mountains, nor from the countryside. To overcome these barriers, Chelo had to encourage farmers who bred pigs for other, more powerful companies. To continue growing, another problem that the entrepreneur faced was that she needed workers with a high professional and specialised level.

Starting a business always comes with some challenges. According to Eila Kaijärvi-Pekkola, one of the biggest challenges was to build the company's credibility in an environment where age discrimination is common. "It was a big task that we are still working on today" (Eila Kaijärvi-Pekkola, personal communication, 23 March 2021). In a small municipality, matching customers is also a challenge. Most of the company's clients are very old and the annual withdrawal due to death or transfer to a care facility is quite considerable. Naturally, this is also mentally difficult for both the employer and the employees. Another added difficulty has been to be able to find tasks for the male employees of the company, who could not perform home care services. Most of the challenges have been met by constantly building trust between customers and other stakeholders: though listening and respect, but also by producing high quality and affordable services. For Kaijärvi-Pekkola, networking has played an important role in overcoming different challenges. The company has established good relations with the municipality, public guardianship and local businesses. This made it possible to expand the customer base.

The Slovakian case encounters the difficulty that social enterprises are emerging very slowly in the country, currently there are about 300 of them. However, in the implementation of the enterprise they have not encountered insurmountable problems since it is a municipal initiative that has been supported by public institutions. At the end of the fiscal year, the result is that the enterprise generated a profit. 100% of the profits are invested in planning activities to develop the enterprise. In this way, actions were expanded to include comprehensive construction activities, a bakery, a blacksmith's workshop, a domestic products shop, which supports regional producers, an outdoor swimming pool, a distillery and a fitness center.

The Portuguese case does not show any major barriers either, their entrepreneurship has been that of a sole proprietorship, in which they develop an activity in which they do not assume a very risky capital investment.

5.4 Challenges, Difficulties and Solutions in Setting Up a Senior Social Enterprise

For the creation of La Dehesa de los Monteros, the company received technical and legal advice for the development of the rural estates, in accordance with the regulations in force. It also received aid from the Diputación de Málaga's (province government) promotional brand, Sabor a Málaga, for participation in national fairs and events to promote their products. However, Chelo Gámez complains that there has been little or no support from the Administration with regard to the recovery of the species 'rubio dorado'. On the other hand, when La Dehesa was recognised as a social enterprise, it received a public contribution for employing people in disadvantaged circumstances.

When Eila Kaijärvi-Pekkola started the company, she did not receive any financial support or mentoring to set it up. Her status as a retired person made it more difficult to receive any support for setting up the business, as most forms of support were aimed at increasing the employment of people of working age, not retired people. The entrepreneur's persistence, the skills she has gained from her work experience and self-learning have helped her to carry out the administrative management of the business: payroll, invoicing, accounting and tax payments.

Hrhovské služby municipality received support from the Canadian Institute to implement the development plan. Although the entrepreneurship initiative did not receive funding for this plan, they were offered advice on how to implement it in the locality. This led to the creation of the municipal enterprise. They were the first of the local governments in Slovakia to create a plan for the social and economic development of the municipality.

Nuno Rosa Dias did not receive any financial or mentoring support to set up his company. The Portuguese entrepreneur does not create a company, but a company in his own name. He considered, in this case, that he did not need technical advice.

5.5 Impact and Coping with the Health Crisis on the Activity

For La Dehesa de los Monteros, the small size of the company and the exclusivity of the product has allowed it to adapt very quickly to compensate for the sharp downturns in the hotel and catering sector. On the other hand, they have been forced to adapt in order to improve the internal functioning of the company: improving the packaging and perfecting the purchasing and delivery processes. For La Dehesa de los Monteros, the economic crisis has been an opportunity to become a better company. For example, they have had to reinvent themselves and create platforms for online sales to individuals. In this way, the company has experienced a significant growth.

Senioriosaajat Ky has also faced some problems due to the coronavirus: as the employees are elderly, some of them have not been able to work for more than a

year. However, with vaccinations and reduced infection rates, the situation has improved.

6 Discussion

The bibliography cited in this paper shows that in recent decades there has been a growing interest in understanding and promoting the participation of older people in entrepreneurship. As life expectancy increases and the population pyramid inverts, it becomes crucial to explore new economic opportunities for this group. In this regard, academic studies on older entrepreneurship in the social economy have become highly relevant.

Academic research recognises and values the entrepreneurial potential of older people. This work identifies the unique skills, experiences and knowledge they possess, and how they can apply them in the creation and management of enterprises in the social economy. On the other hand, studies on entrepreneurial older people encourage their active economic participation and financial independence. By promoting entrepreneurship among this demographic group, they are given the opportunity to generate income, stay active and contribute to the economic growth of their communities. In addition, there are negative stereotypes surrounding the capabilities and skills of older people. Senior entrepreneurship challenges these prejudices by providing evidence that older people are capable of entrepreneurship and success in the social economy. This contributes to changing social perceptions towards this social group, promoting a more positive and enriching image of ageing.

Academic studies on older people's entrepreneurship in the social economy have provided an understanding of the factors that influence entrepreneurship at this stage of life, the motivations that drive older people to become entrepreneurs and the specific challenges they face. This knowledge is essential to develop public policies, support programmes and entrepreneurial strategies tailored to the needs of this demographic group. Moreover, the promotion of entrepreneurship among older people in the social economy has a significant social and economic impact. These ventures contribute to job creation, the strengthening of the local business fabric and the generation of community well-being.

Moreover, by involving older people in social economy projects, solidarity, cooperation and social cohesion are fostered. In short, entrepreneurship in old age can have a positive impact on the quality of life of older people. It provides them with an opportunity to reinvent themselves, stay active, develop new skills and establish meaningful social connections. The academic studies cited above have contributed to understanding how entrepreneurship can be a source of personal satisfaction, fulfilment and emotional well-being for older people.

7 Conclusions

The case studies reveal that these are older people who decides to become entrepreneurs in response to a personal motivation linked to the principles of the social economy. Senioriosaajat and Hrhovské služby are two initiatives that are specifically aligned with the postulates of social enterprise. Senioriosaajat is a service enterprise to create participation and employment opportunities for retired seniors. While the aim of the enterprise that drives the activity of Hrhovské služby was to provide employment and social integration for members of the Roma ethnic group. In the Portuguese and Spanish cases, although they are also examples of social enterprises, the principles of the social economy are not evident in the genesis of the business strategy of these enterprises.

The results of this research show the importance that senior entrepreneurs attach to studying the market before starting the activity. The case of Chelo Gámez stands out, who seeks advice from experts from the University, a context she knows from her previous professional career. Vladimir also created the company based on advice from the Canadian Institute and municipal employees working on a local development plan. On the other hand, there are examples such as the Finnish entrepreneur, who researches the Finnish labour market and the situation of the elderly before setting up an informal business. In either case, market research can be interpreted as an exercise in responsibility and a strength that distinguishes senior entrepreneurship.

Setting up a new business in itself involves facing challenges and overcoming numerous difficulties. In the case of the senior entrepreneurs analysed, we find sociological barriers such as the entrepreneurship carried out by Chelo Gámez. The Spanish businesswoman had to fight against a traditional, immobile and sexist sector. Kaijärvi-Pekkola suffered from age discrimination. It has been mentioned that she was refused access to a course for entrepreneurs because it was aimed at young people. Fortunately, Kaijärvi-Pekkola's extensive work experience in administrative and financial tasks and the firmness of the business idea made the process of founding the company a success. Despite the ageing situation, the Finnish entrepreneur is very satisfied with her decision to become an older entrepreneur.

We have seen how difficulties in entrepreneurship have been overcome by soft skills such as courage, perseverance, sacrifice and effort, values seemingly destined for extinction. Despite the attitude and the wide range of professional experience and knowledge that older people have acquired in their professional life, they may have no experience in starting up a business. In this case, the creation of a specific senior entrepreneurship training plan is required. While there are many common training needs between young and older entrepreneurs, the latter also have unique learning styles, background knowledge and experience that justify a new and innovative approach to increase social entrepreneurship among older people.

The strength of senior entrepreneurship has been revealed during the pandemic crisis by COVID-19. The case of La Dehesa de los Monteros stands out, which has

undergone a process of adaptation and improvement of the internal functioning of the company.

In conclusion, entrepreneurship and an entrepreneurial mindset are vital resources for both the individual and society. Age should never be an obstacle: everyone should be encouraged and supported to become an entrepreneur, regardless of their age. One of the positive aspects of entrepreneurship in later life is that it forces you to learn new things and keeps your mind active. As this study has shown, creating a social enterprise that hires employees gives the opportunity to help others, but also contributes to the empowerment of older people, the present and future of today's society.

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Part IV
Eurasian Economic Perspectives: Economics of Innovation

Ascent of Regtech: A Bibliometric Analysis of Regulatory Technology

Muslehuddin Musab Mohammed and Ahmet Faruk Aysan

Abstract Under the impact of the fourth industrial revolution, the focus towards Regulatory Technology (RegTech) gained traction. The COVID-19 pandemic has further underscored the necessity for adoption of RegTech to synchronize with the new norm of digital transformation. The research collected the scientific literature on RegTech from the database of Scopus since 1988 until April 15, 2021, and deployed the citations, bibliographic coupling, co-citations, co-authorship, and co-occurrence methods through VOSviewer software to conduct the bibliometric network analysis. The research basically aimed to know the influential articles, authors, sources, and countries as an endeavor to identify the areas of interest in RegTech that are well explored by the researchers and the areas of research that need further attention. The findings indicate that until 2016 the focus of research was on 'Risk management and Fraud Detection', however since 2016 the focus has been on 'Effective Supervision and Regulation' in addition to 'Technological Advancements'. Moreover, the 5 years period of 2016–2020 has been crucial for the publications on RegTech.

Keywords Bibliometric analysis · RegTech · Regulatory technology · Scopus database · Research profiling

1 Introduction

Regulatory Technology or RegTech refers to technological solutions that streamline and improve regulatory processes (Arner et al., 2018; Becker et al., 2020). The motivation behind writing this paper lies in the increasing importance of RegTech in the financial sector, particularly considering the challenges posed by the

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COVID-19 pandemic and the need for effective regulatory supervision. By conducting a comprehensive bibliometric analysis, this research aims to provide valuable insights into the current state of RegTech research and identify areas that require further investigation. The paper's contribution lies in its exploration of influential authors, prominent journals, and emerging themes, which will enhance our understanding of the contemporary landscape of RegTech and inform future research endeavors.

While reviewing the literature on the bibliometric study on RegTech, we noticed that not much has been done on bibliometric analysis of RegTech due to the recent re-emergence of the field and the paper shall fill this gap in the scientific domain. However, some interesting bibliometric analysis with the focus on the RegTech related field called FinTech, blockchain and bitcoin has been done by some researchers. Lakhe and Kulkarni (2020) relied on the papers available in Scopus for the period of 2000–2019 to conduct the bibliometric analysis of Fintech regulations. The researchers found that the publication trend has been increasing since 2015 and geographically US and UK followed by China are leading the publications' quantitative metrics. It is also noted that the research in the FinTech regulations has recently gained the interest of the researchers and it shall continue as the citations had been growing historically across all the years of research.

Recent publications of Khamis and Aysan (2022), Dosso and Aysan (2022), Abubakar and Aysan (2022), and Aysan et al. (2021), have presented notable bibliometric studies. For example, Aysan et al. (2021) explored the research areas and funders of Bitcoin-related studies, while Aysan and Unal (2021) conducted a bibliometric analysis on Fintech and Islamic finance, highlighting areas such as cryptocurrencies, micro-finance, impact investing, and SRI investing. These studies have contributed insights into the current state of research in their respective fields and identified areas for further investigation. Henceforth, by conducting a comprehensive bibliometric analysis of RegTech, this research aims to provide valuable insights into the current state of RegTech research and identify areas that require further investigation.

The analysis utilized data from Scopus, a reputable database for scientific literature, and employed various bibliometric analysis methods, including citation analysis, co-citation analysis, bibliographic coupling, co-authorship analysis, and co-occurrence analysis. The VOSviewer tool was used for data visualization, while Microsoft Excel aided in data cleaning and quantitative analysis. Durieux and Gevenois (2010) classified these bibliometric network-based insights into quantitative, qualitative, and structural indicators, which respectively measure productivity, performance and output, and connections among researchers, publications, and research areas. Roldan-Valadez et al. (2019) emphasize the usefulness of citation-based metrics for evaluating impact, output, and prestige.

The main findings of the research are that the UK and USA are the primary sources of RegTech publications, while influential authors are predominantly from Hong Kong, Luxembourg, Australia, and Switzerland mainly from the specialization of legal studies. Co-authorship positively impacts authors' productivity but not necessarily their quality. Research on RegTech has shifted towards effective

regulation and technological advancements since 2016, moving away from a previous emphasis on risk management. Journal articles in business management, accounting, economics, econometrics, finance, and computer science are preferred, while book chapters and conference papers on RegTech are less prevalent. Limited research exists on financial policy aspects, such as stability, sustainability, crises, and risk assessment.

The analysis will address research questions related to the main contributors to RegTech research, the areas of RegTech that have been well covered, and the areas that require further research. Therefore, the research questions are as follows:

(RQ1) Who are the main contributors to scientific research on RegTech?
(RQ2) What are the areas of RegTech that are well covered by research works?
(RQ3) What are the areas of RegTech that need further research?

The structure of the paper is as follows: The introduction provides an overview of the topic along with the literature review and the research questions. The methodology of the research and overview of publications are presented in the second section. The third section focuses on the analysis of sources, authors, documents, and contents along with the interpretation of the results. Eventually, the fourth section concludes the paper.

2 Methodology and Overview of the Publications on Regtech

The methodology of this research paper involved the collection of data from the Scopus database and the application of various bibliometric analysis methods. Initially, the study aimed to select appropriate keywords used by authors in the field of regulatory technology within the Scopus database, covering the period from 1988 to April 15, 2021. The search began with individual keywords “Regtech” and “Regulatory Technology,” but the results were unsatisfactory. To refine the search, combinations of bullions “OR” and “AND” were employed, such as (“Regulatory Technology” OR “RegTech” AND “Finance”) and (“Regulatory Technology” OR “RegTech” AND “Compliance”). However, these yielded insufficient results. Considering the overlapping nature of regulatory technology and FinTech, the search string was modified to include (“Regulatory Technology” OR “RegTech” OR “FinTech”), which resulted in 1958 documents, predominantly related to FinTech. To focus specifically on regulatory technology related to finance, the search string was adjusted to (“Regulatory Technology” OR “RegTech” AND “FinTech”), which limited the results to 49 documents. Finally, the search string (“Regulatory Technology” OR “RegTech”) was used, resulting in 147 documents directly related to the area of interest, with consistent keyword count of 32 times for “RegTech” and limited occurrences of “FinTech” from 920 times to 20 times. This ensures that no documents pertaining to the area of interest are missed while only those papers related to regulatory technology are exclusively collected from the database.

By reviewing the search results and deploying the documents type filter in excel, it is noticed that there are 147 documents as plotted in the Table 1 below. There is 1 erratum published in 2021 which is dropped from the bibliometric analysis. Hence, 146 documents dating back from 1988 and until 15 April 2021 are selected for bibliometric analysis.

The study utilized various bibliometric methods including citation analysis, co-citation analysis, bibliographic coupling, co-authorship analysis, and co-occurrence analysis. Network data generated from these analyses was visualized and explored using the VOSviewer tool developed by van Eck and Waltman (2017). Data cleaning and quantitative analysis were conducted using Microsoft Excel. The Scopus database by Elsevier was chosen due to its strong recommendation and reputation as a top database for accessing high-quality scientific literature, including books, conference papers, and journal articles. Scopus was preferred over other databases, like Web of Science, due to its compatibility with the requirements of bibliometric analysis (Fellnhofer, 2019; Zupic & Čater, 2015). One key factor in selecting Scopus was its university augmented access, which facilitated the extraction of a "CSV" (Comma Separated Version) file. This file format was compatible with the bibliometric analysis tool, VOSviewer, allowing for effective analysis of the collected data. Thus, by employing these methodologies and utilizing Scopus as the primary database, this research paper aims to provide a comprehensive and reliable analysis of the RegTech research landscape.

As depicted in Fig. 1 below, the publication on RegTech has been regular since 2012 and the number of publications per year also gained momentum. Since the year 2016, under the impact of contemporary fourth industrial revolution, the publication on RegTech rose up and thereby synchronized with the transformation of RegTech 3.0 in 2018 which is also the median year of publications indicating that over half of the publication had happen in last 3 years.

Table 1 Composition of the Publication in the Database

		Type of Publication								Total	
Language		Article	BK	BKC	CNFP	ERR	Note	Rev	SS	#	%
English		86	1	11	29	1	1	8	1	138	93.88
Chinese		3	0	0	0	0	0	0	0	3	2.04
English/ German		1	0	0	0	0	0	0	0	1	0.68
German		1	0	0	0	0	0	0	0	1	0.68
Italian		1	0	0	0	0	0	0	0	1	0.68
Japanese		1	0	0	0	0	0	0	0	1	0.68
Russian		1	0	0	0	0	0	0	0	1	0.68
Spanish		1	0	0	0	0	0	0	0	1	0.68
Total	#	95	1	11	29	1	1	8	1	147	
	%	64.63	0.68	7.48	19.73	0.68	0.68	5.44	0.68		

BK Book, *BKC* Book Chapter, *CNFP* Conference Paper, *ERR* Erratum, *Rev* Review, *SS* Short Survey
Source: Own work

The quantitative metrics related to countries of origin provide insight about the regions active in publication. As per the metrics of Scopus, the 146 documents have 199 publications by 41 countries in during the period of study, however the source of four publications remains unknown. As in Table 2 below, around half (53.33%) of the publication had happened in 6 countries. The period of the last 5 years, 2016–2020, has been crucial for the publications related to RegTech. China's and Hong Kong's publication was exclusively in last 5 years, while United Kingdom, Australia and Germany have more than 80% and USA has 73% of their publications during the said period. By reviewing the instance of relevant publication from the rest of the Asian countries, it is ascertained that Asia's history of publication on RegTech doesn't surpass the period of last 5 years.

The Citation Index (CI) in Table 3 below confirms the quality of the articles (Fellnhofer, 2019). There are 1379 citations in total, with an overall average of 33.63 citations, the top 5 countries' CI is far above the overall average. However, the normalization has been applied for comparing the CI of countries. The normalization has been done through VOSviewer by dividing the number of citations of a document by the average number of citations of all documents published in the same year and included in the data that is provided to VOSviewer (Van Eck & Waltman, 2017). As per the result in Table 2, United Kingdom with the Normalized Citation Index (NCI) of 57.92 topped the list, followed by Australia and Hong Kong with the NCI readings of 36.71 and 28.42 respectively. Interesting to note that the prolific production does not necessarily make the country impactful, because the quantitative metrics of USA (22 publications) at fifth position are higher than three preceding countries in the ranking list. Further, Table 2 reveals that the United Kingdom with its historical presence not only leads the list in both the metrics of the quantitative and impact analysis, but it also has the richest network of 14 LCs. Each one of USA and Germany has the second richest network of 12 LCs. Although Hong Kong at the third rank has no publication history prior to 2016, nevertheless it shows high potential with NCI of 28.42 to be an impactful country in future for publications related to RegTech.

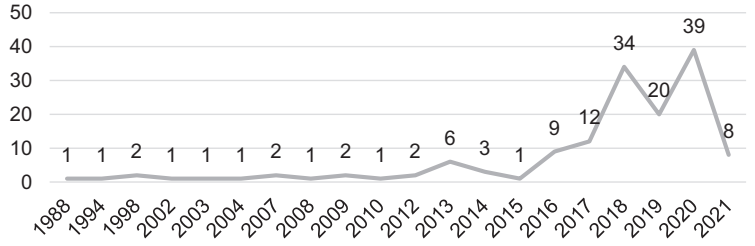


Fig. 1 Publication frequency and growth in RegTech literature. Source: Own work

Table 2 Top 6 Countries Publishing Prolifically on RegTech

	Publication Metrics		Regional Publication during 2016–2020						
								Total	
Country of origin	Quantity	Percentage %	'16	'17	'18	'19	'20	#	%
United Kingdom	33	16.92	1	2	11	3	12	29	88
USA	22	11.28	5	0	3	7	1	16	73
Australia	16	8.21	0	3	3	1	6	13	81
Germany	16	8.21	1	1	2	3	6	13	81
China	9	4.62	0	1	4	1	3	9	100
Hong Kong	8	4.10	1	2	0	2	3	8	100

Source: Own work

Table 3 Top 10 Impactful Countries Based on the Normalized Citation Index

			Network		Citation	
Rank	Country	Publication	LC	TLS	CI	NCI
1	United Kingdom	33	14	23	374	57.92
2	Australia	16	8	19	205	36.71
3	Hong Kong	8	7	17	103	28.42
4	Germany	16	12	29	55	25.23
5	USA	22	12	18	204	24.02
6	Luxembourg	7	8	21	23	18.09
7	Ireland	7	0	0	88	8.52
8	France	5	2	2	56	7.46
9	China	9	2	2	38	7.3
10	Switzerland	5	6	7	13	6.33

LC Linked Country, *TLS* Total Link Strength, *CI* Citation Index, *NCI* Normalized Citation Index
Source: Own work

3 Results and Discussion

3.1 Analysis of Publications' Sources

As of April 15, 2021, there were 118 sources on RegTech in the Scopus database. The quantitative analysis focused on 37 sources that met the selection criterion of having more than 1 document or at least 9 citations. These sources were categorized as journal articles (81.08%), conference papers (16.21%), and book chapters (2.70%). The year 2018 had the highest number of sources, including the only book chapter, while 2018 and 2020 had the same number of sources. In terms of subject area, the citation analysis would concentrate on sources related to economics and finance.

As per the citation analysis criterion, the 9 sources in Fig. 2 below were found fit for the analysis, wherein the conference paper category was excluded as such it does not have any source related to either of economics or finance areas. Since the citation analysis of the source reveals the contribution of sources to the particular field

of interest with some limitations (Aksnes et al., 2019); So, to gain the insights related to citation status of sources related to RegTech publication, the paper undertakes the exercise of quantitative metrics analysis, citation, co-citation and bibliographic coupling as well as interprets and processes the data available in Scopus database through the VOSviewer software.

The co-citation analysis by VOSviewer found 3806 instances of co-citation, however only 19 sources were shortlisted after setting a minimum of 10 co-citations as threshold condition. All the top 10 sources in the Table 4 below belonged to the journal category which implies that the most important scientific output on RegTech lies in journals, rather than book chapters and conference papers. Interestingly, the entire top 10 co-citations were related to two subject areas, namely, 'Business Management and Accounting' occurred 7/10 times and 'Economics, Econometrics and Finance' which completed rest of 3/10. The co-citation analysis indicates that the scientific journals related to 'Business Management and Accounting' and 'Economic, Econometrics and Finance' are potentially good sources to study RegTech.

3.2 Analysis of Publications' Authors

There were 285 authors affiliated to 160 institutions across the globe who contributed to the scientific discourse on RegTech in the Scopus database. A set of 49 documents were contributed by those authors who have the contribution of more than 1 document to the database. The quantitative metrics along with CI and H-Index in Table 5 below provide a good factor for impact assessment of authors. The CI reflects the recognition of the author in the research universe, while H-Index

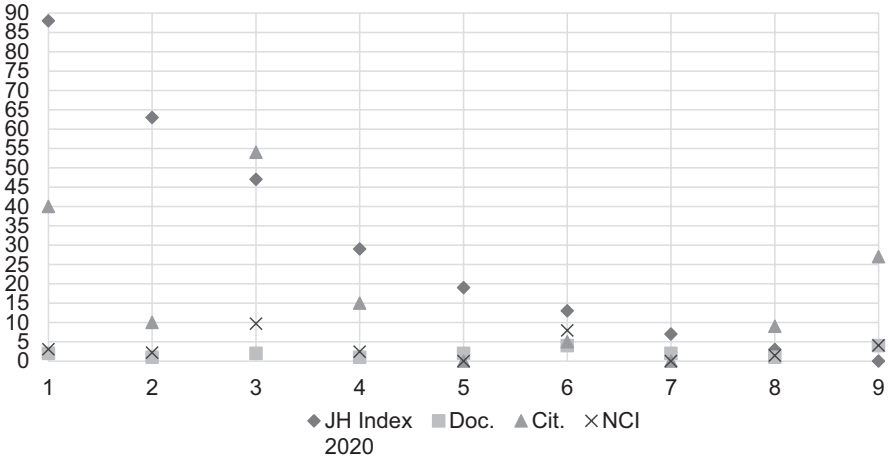


Fig. 2 Citation Brief of Publications' Sources of Economics and Finance. Source: Own work

Table 4 Top 10 Publications' Sources based on Co-Citation

Source	TC	TLS	Subject Area
Journal of Cleaner Production—(UK)	28	10.04	Business Management and Accounting
Journal of Financial Transformation—(USA)	23	11.42	Economics, Econometrics and Finance
Economy and Society—(UK)	22	6	Business Management and Accounting
Business Strategy and the Environment—(UK)	21	11.95	Business Management and Accounting
Res. Policy—(Netherland)	19	7.97	Business Management and Accounting
Accounting, Organizations, and Society—(UK)	17	5	Business Management and Accounting
Journal of Money Laundering Control—(UK)	15	3.91	Economics, Econometrics and Finance
Journal of Payments Strategy & Systems—(UK)	15	1	Business Management and Accounting
Research Policy—(Netherlands)	15	12.7	Business Management and Accounting
Ecol. Econ.—(Netherlands)	13	7.97	Economics, Econometrics and Finance

TC Total Citations, *TLS* Total Link Strength
Source: Own work

indicates the overall quality of work produced by the author. Usually, due to the wider scope and easy-to-access features of the 'Google Scholar' database, the H-Index values of the authors in 'Google Scholar' are greater than the corresponding values in 'Scopus' database. The result of H-Index in our examination has two exceptions, the author at Rank 3, Barberis J. N., couldn't be traced in 'Google Scholar' and the author at Rank 10, Anderson J. N., whose corresponding value of H-Index is greater in 'Scopus' than in 'Google Scholar'.The aggregated cases of such unusuality could be studied in another independent research. The result of H-Index suggests that the region of Europe, especially UK, is prolific in producing the high-quality research works. However, more precise information about the quality of work related to RegTech can be asserted by reviewing the result of CI analysis.

The CI indicates that Arner D.W., with 83 instances of citations topped the list which syncs well with the highest number of documents he produced. Similarly, Buckley R.P and Barberis J.N, respectively, with 81 and 72 CI are also among those who have high number of CI along with the greater number of documents. But, in case of the authors ranking from 4 to 8, each of them has a CI of greater than 50 while their individual contribution is limited to only one document. The impact of 'seniority of the authors', 'scope-of-interest of the researcher' and 'the multi-dimension aspect of the document' on CI could be good topics for another research.

By applying a threshold condition of at least one document and one citation, a co-authorship analysis was conducted using VOSviewer. Among 164 authors

Table 5 Qualitative Analysis: Based Top 10 Authors with highest CI

Rank	Author	Affiliation	Country	Doc.	CI	H-Index
1	Arner D.W.	University of Hong Kong	Hong Kong	7	83	8–29
2	Buckley R.P.	University of New South Wales	Australia	6	81	6–29
3	Barberis J. N.	University of Hong Kong	Hong Kong	4	72	3–N/A
4	Cabot H.	College of the Atlantic	USA	1	59	7–10
5	Dodge M.	University of Manchester	UK	1	59	10–41
6	Kitchin R.	National University of Ireland	Ireland	1	59	43–76
7	Moloney N.	London School of Economics and Political Science	UK	1	58	17–11
8	Anagnostopoulos I.	Kingston Business School	UK	1	51	2–15
9	De Filippi P.	National Center of Scientific Research (CNRS)	France	2	45	7–23
10	Anderson J.N.	Monash University	Australia	1	44	13–6

Doc Document, *CI* Citation Index
Source: Own work, based on H-Index values from Scopus & Google Scholar and arranged as (Scopus—Google Scholar)

Table 6 The Co-Authorships Based on Total Link Strength

	Arner D.W.	Buckley R.P.	Zetzche D.A.	Berberis J.N.	Weber R.H.	Vedit R.
Vedit R.	0.33	0.33	0.33			0.01
Weber R.H.	0.33	0.33	0.33		0.01	
Berberis J.N.	2.33	1.33	0.33	0.01		
Zetzche D.A.	1.50	1.50	0.01	0.33	0.33	0.33
Buckley R.P.	2.50	0.01	1.50	1.33	0.33	0.33
Arner D.W.	0.01	2.50	1.50	2.33	0.33	0.33

Source: Own work

meeting this criterion, Table 6 below displays the co-authorship matrix of the top 6 authors. The top three authors demonstrate a significant level of co-authorship, corresponding to their high productivity in terms of document output. Co-authorship is found to enhance author productivity, although the H-Index is influenced by various other factors as mentioned previously. Notably, the common feature among all six co-authors is their affiliation with the field of law, indicating a shared subject affiliation.

The analysis of authors by examining the citations, H-Index and co-authorship aspects concludes that Arner D.W., Buckley R.P and Barberis J.N. have outstanding recognition and manifest the reference point for the scientific content related to RegTech. The faculties of law at the universities in Hog Kong, Luxembourg, Australia, and Switzerland have the evidence for international collaboration for their contribution to the studies on RegTech. Seldom the dual affiliation of authors like Arner D.W. with his affiliation to Hong Kong as well as UK may create

evidence for other countries too. Apart from the above, USA, Bahrain and Germany also have the co-authorship evidence but not for cross-border co-authorship collaboration.

3.3 Analysis of Publications' Documents

The quality of publication can be analyzed by counting on the number of citations received, thereby viewing them through the prism of bibliographic coupling (Van Eck & Waltman, 2017) could help gauge the impact of the articles. The below Table 7 enlists the 10 most cited articles based on Field Weighted Citation Index (FWCI).

The articles during the period of study have received 971 citations with an overall average of 6.60 citations per article. Impact of article is assessed by comparing the citations, however such comparison by considering TC would reap biased results, for older the publication higher the chances of increased number of citations prevail. Therefore, the general impact of the article is better assessed by Avg. NCI. The Avg. NCI for the citation of article has been applied by subtracting the mean citations from the citations of the given article and dividing the result by standard deviation of all documents published in the same year and included in the total documents analyzed (Van Eck & Waltman, 2017). As depicted in Table 5, in terms of general impact the articles "Sustainability, FinTech and Financial Inclusion" and "FinTech and RegTech: Impact on regulators and banks" topped the list with the Avg. NCI of 5.42 and 4.93 respectively, while the article "FinTech, RegTech, and the reconceptualization of financial regulation" with the Avg. NCI of 4.32 acquired the third place.

The FWCI provides a metric for the performance of the document in comparison with similar documents from the same field over the period of 3 years. A value greater than 1.00 means that the document is more cited than the average. The researcher believes that the highest ranking of Miraz and Donald (2018) in FWCI despite the smaller number of TC is due to the applied nature of the topic that synchronizes fully with the era of digital transformation.

The bibliographic coupling identifies the common references in two documents which indicates the overlapping of the content of the documents (Zupic & Čater, 2015). The criterion for bibliographic coupling was set at 5 articles as minimum shared citations in each set of the articles, VOSviewer tool identified 45 documents, 53 Links and Total Link Strength (TLS) of 111, however 28 documents among them were linked together through the 53 links with TLS of 109. The interpretation of results follows the rule, higher the TLS higher the overlapping of content of the documents.

The Table 8 below enlists the top 10 articles with highest TLS, the first two journal articles, authored by Willams J.W, were published in 2013 and 2009 respectively, and the last article by Lane R was published in 2012, while most of the articles were published between 2018 and 2020 with an only exception of 'What is

Table 7 Citation analysis of the 10 most cited articles

Rank	Document Title	Year	TC	Avg. NCI	FWCI
1	Application of Blockchain in Booking and Registration Systems of Securities Exchanges By Miraz, M.H. and Donald, D.C.	2019	14	1.33	11.36
2	Sustainability, FinTech and Financial Inclusion By Arner D.W.	2020	9	5.42	10.13
3	FinTech, RegTech, and the reconceptualization of financial regulation By Arner D.W. et al.	2017	62	4.32	8.69
4	Sustainability-oriented capabilities for eco-innovation: Meeting the regulatory, technology, and market demands By Demirel, P.	2019	32	3.72	6.82
5	FinTech and RegTech: Impact on regulators and banks by Anagnostopoulos I.	2018	54	4.93	4.45
6	Evolutionary Approaches and the Construction of Technology-Driven Regulations By Yang, D., Li, M.	2018	15	0.91	3.85
7	Blockchain technology as a regulatory technology: From code is law to law is code By De Filippi, P., Hassan, S. et al.	2016	59	1.96	3.3
8	The road to RegTech: the (astonishing) example of the European Union By Buckley, R.P.	2020	4	2.39	2.94
9	A Case Study of Using Blockchain Technology in Regulatory Technology By Gozman, D.	2020	3	1.63	2.3
10	What is an algorithm? Financial regulation in the era of high-frequency trading By Coombs, N.	2016	39	1.03	2.28

TC Total Citations, *Avg. NCI* Average Normalized Citation Index
Source: Own work

an algorithm? Financial regulation in the era of high-frequency trading' by Coombs N which was published in 2016. Hence, the entire articles which are highly overlapping are ranging from 2009 to 2020. The chronological review of the topics revealed by bibliographic coupling could enable us to comprehend the scientific evolution of the field (Zupic & Čater, 2015), thereby it is apparent that until 2016 the focus was on risk management and fraud detection, however since 2016 the focus has been on effective supervision and regulation in addition to the technological advancements.

The subject areas of the clusters in Bibliographic coupling depicted in Fig. 3 below are as follows:

1- FinTech, RegTech and issues related to customers identification and financial inclusion (cluster 1, 7 publications)
2- FinTech, RegTech and underlying technologies and the customer protection (cluster 2, 7 publications)
3- Regulatory technology as market efficiency booster and frontline decision maker (cluster 3, 5 publications)
4- Regulatory technology related to non-financial arena (cluster 4, 4 publications)
5- Trending technologies in the existing era and the future of RegTech (cluster 5, 3 publications)

Table 8 Bibliographic coupling of 10 articles with highest 'Total Link Strength'

Rank	Document title	Year	TLS
1	Regulatory technologies, risky subjects, and financial boundaries: Governing 'fraud' in the financial markets	2013	42
2	Envisioning financial disorder: financial surveillance and the securities industry	2009	35
3	Financial technology: a review of extant literature	2019	16
4	Sustainability, FinTech and Financial Inclusion	2020	15
5	What is an algorithm? Financial regulation in the era of high-frequency trading	2016	15
6	Blockchain Technology and Financial Regulation: A Risk-Based Approach to the Regulation of ICOs	2019	9
7	The Identity Challenge in Finance: From Analogue Identity to Digitized Identification to Digital KYC Utilities	2019	8
8	FinTech and RegTech: Impact on regulators and banks	2018	8
9	An innovative RegTech approach to financial risk monitoring and supervisory reporting	2018	8
10	The promiscuous history of market efficiency: the development of early emissions trading systems	2012	6

TLS Total Link Strength
Source: Own work

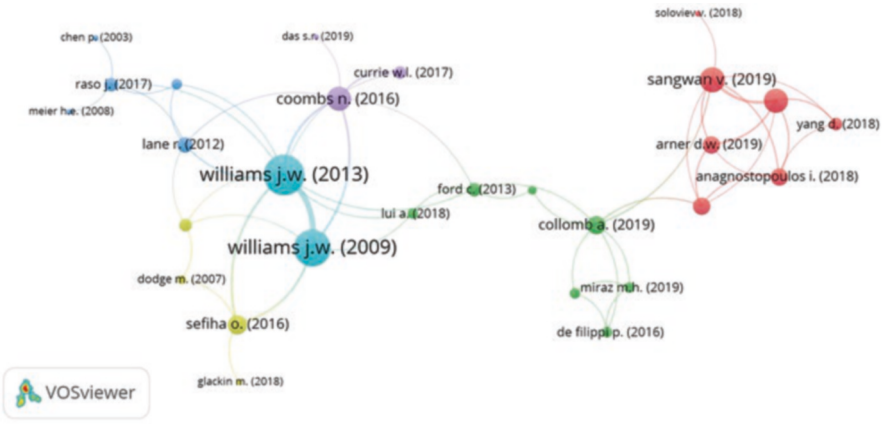


Fig. 3 Bibliographic coupling of Articles. Source: Own work with the help of VOSviewer

6- Contribution of technology in fraud detection and financial security and surveillance (cluster 6, 2 publications)

The VOSviewer depicted the document in six interrelated research domains. The distance between the clusters demonstrates the level of similarity between the documents, the shorter the distance the more they are similar (Alshater et al., 2020). Therefore, cluster 6 and cluster 2 are placed closely although sequentially they fall apart.

3.4 Content Analysis of the Publications on Regtech

The analysis of keywords provides useful information about the author's perception about his/her contribution to the scientific field in a given domain (Chen et al., 2016) and the VOSviewer enhances those perceptions by adding sets of keywords generated by the bibliometric tool, however the keywords identified by authors are more accurate in terms of the contribution to the scientific field. Nevertheless, the content analysis through co-word exercise by including both the key words reported by author as well as the keywords discovered by the VOSviewer shall be very useful in identifying the themes that have been explored so far.

Across the set of 146 documents, total 888 keywords have 1251 times of occurrences, 755 (60%) keywords among them occurred only once. Out of them, keywords that occurred for 4 or more times comprised 21.42%. Since 60% of the keywords had one time occurrence, therefore 133 keywords representing 40% of entire set of keywords were selected by setting a minimum 2 occurrences of the keyword as threshold condition for the keyword analysis by VOSviewer. The keyword co-occurrence analysis was conducted for further analysis of keywords. The analysis of keywords co-occurrence reveals that out of the eight clusters in Fig. 4 below, the cluster 4 'Regulation & Publications on Drugs and Narcotics' and the cluster 5 'Technology & Nuclear Science' are focused on the implementation of regulatory technology in non-financial sectors.

The cluster 1 is focused on the theme of 'Technology, Finance & Regulation'. It has the central position with the mostly dense and highly repeated keywords related to 'RegTech' and 'FinTech'. The cluster also highlights the major concerns of regulators, such as 'Anti Money Laundering', 'Financial Inclusion' and 'Financial Stability'. Among the technologies, the 'Blockchain' technology is the mostly discussed technology in this cluster.

The cluster 2 is focused on the theme of 'Regulatory Compliance & Technology'. It revolves around the issues related to data transparency and data control regulations with a special reference to the 'European Commission'.

The cluster 3 is focused on the theme of 'Regulatory Framework & Risk Management'. The terms like 'Algorithmic Trading', 'High Frequency Trading' 'Information Use' suggest that the 'Risk Perceptions' related to technological aspects of the 'Financial Market' and trading are pivotal in this cluster.

The cluster 6 is focused on the theme of 'Artificial Intelligence & Financial Market'. This cluster of 8 keywords revolved around the usage of 'AI' and 'Robo Advisory' for the purposes of 'Law' and 'Legal Informatics'.

The cluster 7 is focused on the theme of 'Financial Regulation'. The link with the farthest placed 'DLT' establishes the evidence for a weak link to the usage of DLT for 'Financial Regulation' purposes.

The cluster 8 'Regulatory Approach (Brown)' has no other keyword to suggest that the theme can be explored further by the researchers.

The overlay visualization of keywords is useful to identify the evolution of the research areas across the period of study, thereby the emerging topics of the research

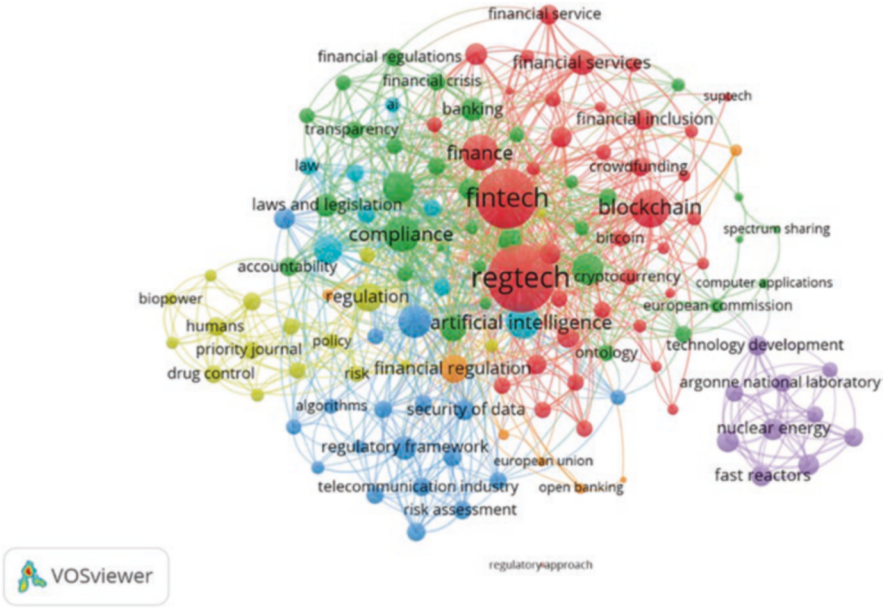


Fig. 4 Network visualization of keywords co-occurrence based on TLS. Source: Own work with the help of VOSviewer

can be traced. The overlay visualization by VOSviewer categorize the items in the networks based on the years of publication as scores and assign the colors of items from blue through green to yellow for indicating the chronology of the research from the oldest to the latest (Van Eck & Waltman, 2017). In our study as depicted in (Fig. 4) the period until 2021 has been covered by assigning blue to the research works until the mid of year 2013, followed by the variants of green and yellow to reach the mid of year 2021.

The network analysis is based on categorization of networks based on the similarity and relatedness. The distance between the set of keywords gauges the relatedness between them and the strength of the bonding is represent in the lines or total link strength (Van Eck & Waltman, 2017). Further the density maps by the VOSviewer help reveal the depth of the emerging topics discovered by the overlay of visualization. Therefore, the depth was assessed by considering the links and TLS scores as mentioned below.

The result of such analysis revealed following five topics are setting the contemporary research trend:

1. Risk Management (Cluster 3, Links 21, TLS 30)
2. Compliance (Cluster 2, Links 19, TLS 23)
3. Banking (Cluster 2, Links 16, TLS 17)
4. Artificial Intelligence (Cluster 7, Links 12, TLS 20)
5. Anti-Money Laundering (Cluster 1, Links 15, TLS 13)

The density visualization of emerging topics reveals that most of the emerging topics have low scores of occurrences which is inevitable for any field during the period of its emergence.

4 Conclusion

The bibliometric analysis of our study covered the publications within the Scopus database on the topic of 'RegTech or Regulatory Technology' for the period between 1988 and 15th April 2021. Until that date, the database had 147 relevant publications in 8 languages, among them 138/147 are in English. Overview of the publications revealed that since 2012 the publication on RegTech has become regular. The review of the frequency of publication showed that 2018 is the median year and since 2018 the publication gained momentum synchronizing with the transformation to RegTech 3.0. However, the period of last 5 years, 2016–2020, has been crucial for the publications on RegTech as the countries from Asia has 100% contribution during it, whereas the regions of Europe, Australia and America had more than 70% of their publication during the last 5 years. The data base has only one publication per country for the countries from Middle East, Southeast Asia, and Africa regions.

The scientific enquiry based on bibliometric analysis concluded that UK and USA have the leading sources and publications on RegTech in Scopus, while the prolific and impactful authors on RegTech are from Hong Kong, Luxembourg, Australia, and Switzerland. Further, the cross-border network has been found among the authors contributing prolifically with the prominent commonality of their affiliation to the field of law. Nevertheless, USA, Bahrain and Germany also have the evidence for co-authorship connections but not for cross border co-authorship collaborations. It is noted that the co-authorship has a direct and positive impact on the quantitative productivity figures of the authors, however such a positive impact cannot be ascertained for the authors' qualitative performance.

The bibliometric examinations of the scientific research on RegTech in Scopus database have strong evidence for the extended interest of researchers in the 'Journal Articles' belonging to the domain of 'Business Management and Accounting', 'Economics, Econometrics & Finance' and 'Computer Science' as preferred mode of publication. However, the database has less coverage of publication on 'RegTech' in the form of 'Book Chapters' and 'Conference Papers'. Similarly, the themes and topics related to the technological aspects of RegTech are mostly researched but a low level of investigation in the financial policy related issues such as 'Financial Stability', 'Sustainability', 'Financial Crisis', 'Risk Perception', 'Risk Assessment' and 'Regulatory Approach' is evident in the bibliometric analysis of keyword co-occurrences.

The regions of Middle East, Southeast Asia, and Africa are among the prominent contributors to the research works on Islamic Finance, however the representation of those regions in Scopus database is very weak, so research for exploring the reasons of such weak representation can be a good topic for future research work. Our bibliometric analysis of authors suggested some interesting topics for future research which can be articulated as 'The impact of seniority of author on the citation index',

'The impact of scope of interest of a given author on his / her citations index', and 'The impact of multi-dimension aspect of research paper on citation index'. Similarly, 'The differences of authors' H-Index in Scopus and Google Scholar' can also be investigated as a future topic.

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Questioning the Legitimacy of NFT: A Study on Public Engagement in Indonesia



Ari Okta Viyani, Rangga Almahendra, and Istiana Rahatmawati

Abstract NFT (Non-Fungible Token) as a new entity and social construction in the blockchain ecosystem has been widely discussed recently and is still little researched. Our study seeks to understand how the public can accept and engage with NFT. We use institutional theory and legitimacy theory to explain how these entities can be formed, accepted, and influence people's behavior patterns to explain this phenomenon. This study identifies three distinct types of legitimacy in order to analyze the public's perception of NFT. This study will investigate the Indonesian public's engagement with NFT. Data is collected from people involved in the NFT project and those who have bought or sold this entity. The results show that the public engages with NFT entities because of their pragmatic and cognitive preference for NFT. They tend to want quick profits and make quick decisions in investing. They also tend to understand the benefits of blockchain technology. This study also provides findings that the image of crypto companies can affect the process of public engagement on NFT. When the image of a crypto company is high, the relationship between legitimacy and engagement will increase. Still, at a certain point, when the public has known the crypto company, the relationship between legitimacy and engagement is not stronger than before.

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1 Introduction

In the future, the social evolution of space, the distinctions between actual and virtual reality, live humans and virtual bodies, and the private and public spheres will become more blurred (Schultze & Mason, 2012). In modern global culture, people increasingly live in an environment that merges virtual and physical reality. The virtual world has become an addiction for everyone in modern times.

The virtual world's immense influence has resulted in various virtual items' appearance. According to Trautman (2021), a virtual asset is designed in such a way that it may perform the same function as a tangible item in a digital domain. The value of virtual assets are not merely for their utilitarian and aesthetic qualities but also for their symbolic role in shaping new identities and social interactions. As a result, people purchased virtual assets for many of the same reasons as they purchase actual goods.

Non-Fungible Token (NFT) is a new type of digital assets, a blockchain-based token that is unique, valueable and indivisible (Regner et al., 2019). NFTs can be manifestated in various digital asset. The most common types are collectibles or works of art, objects in the virtual world, and digital characters from sports and other gaming platform. The value of NFT begins by registering ownership of digital assets on the blockchain. Furthermore, these digital assets can be sold with a change of ownership and payment of cryptocurrencies registered on the blockchain (Dowling, 2021).

NFT exists to change works of art that should be admired in person but can now be enjoyed virtually or digitally. That resulted in the formation of a new universe known as the metaverse (Wang et al., 2021). The metaverse is a post-reality universe, an immutable and persistent multiuser environment that combines physical reality with the virtual (Mystakidis, 2022). NFT is one of the supporting aspects of the development of the metaverse world. This digital NFT is one aspect of goods and technology that will later be traded and used in this new universe.

NFT during the pandemic can also be a solution for artists and collectors to publish their work (Trautman, 2021). NFT connects blockchain to art and other creative works, thus presenting a unique computer code/token that is different from other tokens so that NFT can turn digital goods that can be copied endlessly into something unique and different from one another. According to Umar et al. (2022), NFT can also absorb risks during COVID-19. NFTs are said to be able to withstand shocks compared to other asset classes.

NFT was first discovered in 2013 (Chen, 2018), but the popularity of NFT only became famous in 2018 in Germany and the United States. Furthermore, it will be prominent in Ireland and France in early 2021. The potential of NFT as a new entity that can influence behavior patterns in the social environment still needs to be

empirically researched (Regner et al., 2019). Therefore, this study uses institutional theory and legitimacy theory to capture this phenomenon. The institutional theory suggests that organizations are formed by the institutional environment that surrounds them. Influential ideas are then institutionalized, considered valid, and accepted as the way of thinking of the organization (DiMaggio & Powell, 1983). Institutional theory can explain how an entity can be formed because of the institutional environment. The institutional theory discusses many issues regarding legitimacy. Meyer and Rowan (1977) suggest that to survive, organizations must convince the public or society that the organization is a legitimate entity and deserves to be supported.

Legitimacy is a general perception or assumption that an entity's actions are desirable, appropriate, or appropriate in some socially constructed system of norms, values, beliefs, and definitions (Suchman, 1995). Legitimacy is a variable that has been widely researched; however, investigations of legitimacy in the context of NFT have not been undertaken previously. Previous research generally researched legitimacy using content analysis (Su et al., 2015) and qualitative methods (Worden & McLean, 2017), but legitimacy research using quantitative methods has not been widely carried out. Previous legitimacy research has generally focused on demonstrating the relationship between legitimacy and organizational outcomes (Pollock & Rindova, 2003) and investigating legitimacy acquisition strategies (Cho, Roberts, & Patten, 2010; Suddaby & Greenwood, 2005). Research on individual legitimacy is essential and is still under researched (Diez-Martin et al., 2019; Randrianasolo & Arnold, 2020; Miotto et al., 2020). Our study will examine the legitimacy in the context of NFT using quantitative methods and individual units of analysis.

Suchman (1995) categorizes legitimacy into three dimensions: pragmatic legitimacy, cognitive legitimacy, and moral legitimacy. In the framework of NFT, this study will differentiate between pragmatic legitimacy, moral legitimacy, and cognitive legitimacy. The existence of NFT is gaining greater recognition and acceptance among the Indonesian people. Based on Google Trend Indonesia keyword search data between January 2021 and January 2022, it was determined that there was a rise of more than 100 percent. It demonstrates a rising social trend on NFTs (Detikinet, 2022).

Some of the causes and effects of legitimacy have been studied before (She et al., 2020). These include the size of the company, government sponsorship, technology certification, venture capital investment, and sales of new products. This research will contribute to adding a new construct to the consequences of legitimacy, namely public engagement. This research will examine the constructs of legitimacy and public engagement in the context of NFT in Indonesia. Further, this study will also explore how the process of accepting NFT in Indonesia impacts public engagement with this entity and what factors can encourage or weaken this process. This paper presents a five-part systematics approaches of writing. First, the research background, problem formulation, research questions, research objectives, and research contributions are discussed. Then, in the second section, we discuss the theoretical foundation, the development of hypotheses, and the research model applied. Moreover, in the methodology section, we describe the research methods employed

in regards to study design, population and samples, categories, data sources, research methods, as well as testing research instruments and techniques for analyzing data.

2 Literature Review

2.1 Legitimacy and Public Engagement

There are various preferences among people who accept NFT as a work of art that can replace real works of art and be an investment instrument. This study will explore how a person accepts an NFT using three legitimacy preferences. There are various definitions of legitimacy. Researchers consider legitimacy a multidimensional variable (Miotto et al., 2020). According to Meyer and Rowan (1977), legitimacy can be evaluated in accordance with rational utility, legal mandates, and social values. Aldrich and Fiol (1994) define legitimacy as widespread knowledge of the issue being investigated, socio-political legitimacy, and acceptance of conformity by taking societal norms into account. According to Suchman (1995), this study defines legitimacy as the general belief or assumption that a person's actions are desirable, appropriate, or suitable in any socially created system of norms, values, beliefs, and definitions.

Furthermore, Suchman (1995) proposes three reasons why an individual legitimizes a new entity. Accept it (a) due to its moral standards, (b) due to the cognitive value it offers, and (c) because the entity's goals are aligned with the goals it wishes to achieve/pragmatically. According to institutional theory (DiMaggio, 1988; Scott, 1995), legitimacy-seeking behavior contributes to an understanding of the building blocks of legitimacy, which comprise cognitive, normative, and coercive institutions. Legitimacy can relate to either positive or negative support for a certain social structure based on some culturally accepted narratives.

Theorists who study the legitimacy function describe the social world as a chaotic cognitive environment in which individuals must attempt to organize their experiences coherently to derive explanations of social phenomena (Mills, 1940; Scott & Lyman, 1968). Legitimacy refers to the institutional theory that began its conception based on the understanding that an organization is not just a production system but also a social and cultural system (Scott, 1995). Thus, the institutional perspective stressed the importance of a socially constructed reality where individuals conducted meaning-making of their surroundings (Berger & Luckmann, 1966).

Institutions are seen as resilient social structures composed of cognitive, normative, and regulatory elements that provide stability and meaning for social life; it contain symbolic systems, routines, artifacts, and relational, subject to changes (Scott, 1995). Our study will explore how NFT can be formed, accepted, and influence people's behavior patterns using institutional and legitimacy theory, which is considered capable of exploring public perceptions of a social construct in the form of NFT. Public engagement is also considered capable of influencing the formation of NFT social constructions for receiving and using an entity (Pansari & Kumar, 2017).

Kang (2014) defines public engagement as a psychological motivation in which an affective state brings extra-role behavior, is voluntary, and is characterized by

affective commitment, positive affection, and empowerment experienced by the community/public in interacting with entities from time to time. Public engagement is the ultimate goal that must be achieved if an institution, both private and government institutions, wants to develop an entity in society. To achieve great public engagement, the thing that needs to be done is to find drivers who can make engagement bigger. According to Leston-Bandeira (2014), legitimacy is a driver that can bring the public to engage in a particular entity. Wuestewald (2022) also argues that self-legitimacy in police organizations can enhance people's engagement with police institutions. Legitimacy is also essential for support and public engagement in problem-solving (Boyd, 2000; Coombs, 1992). To find out in more detail what kind of legitimacy preferences can influence public engagement with NFTs in Indonesia. The author explores in more detail the types of legitimacy that can influence public engagement.

2.1.1 Pragmatic Legitimacy and Public Engagement on NFT

Pragmatic legitimacy rests on calculating the self-interest of the organization's most direct stakeholders, such as shareholders (Islam et al., 2022) and Pragmatic legitimacy relies on the self-interested intention of an organization's most immediate audiences (Geels and Verhees, 2011). This proximity is frequently associated with direct interactions between the organization and the audience. Still, it may also be associated with broader political, economic, or social interdependencies, in which organizational activity has a visible impact on the audience's well-being (Geels and Verhees, 2011).

Pragmatic legitimacy occurs when stakeholders perceive their interests to be fulfilled (Suchman, 1995). Entities gain pragmatic legitimacy when stakeholders achieve their goals through them (Diez-Martin et al., 2019). Entities that can be accepted pragmatically will be able to generate engagement because they can meet the goals of each individual to be achieved. Referring to this understanding, the community gains pragmatic legitimacy when it reaches its goals through the adoption of NFT technology. In the first hypothesis, we suggest that public engagement in NFT will result when individuals can pragmatically fulfill each goal. So, the authors hypothesize that:

H1a: Pragmatic legitimacy affects public engagement on NFT

2.1.2 Moral Legitimacy and Public Engagement on NFT

Moral legitimacy relates to organizational rules that comply with normative societal ideologies. The concept is based on society's prevailing notions of what is right and wrong in the world of a governance model. The judgment of moral legitimacy is generally based on the audience's socially constructed value system's assessment of whether the action effectively improves society's welfare. Moral legitimacy is assessed from a consequential, procedural, structural, or personal point of view and can often be distinguished when constituents make claims on their moral standing.

Moral legitimacy reflects a pro-society logic fundamentally different from narrow self-interest (Islam et al., 2022). Moral legitimacy is based on judgments about

whether a particular behavior is a right thing to do. Moral legitimacy refers to ethical decisions about organizational actions (Suchman, 1995).

Moral legitimacy is different from pragmatic legitimacy. The goal of pragmatic legitimacy is to achieve results, while moral legitimacy focuses more on the methods to achieve these results (Diez-Martin et al., 2019). Pragmatic legitimacy is based on self-interest, while moral legitimacy is not. However, individuals can gain this legitimacy. It is if the individual actively participates in the NFT dialogue and does not use NFT for personal gain but prioritizes the welfare or good value obtained from this entity (Islam et al., 2022).

Moral legitimacy arises when individuals perceive NFT adoption as the "right thing to do" (Suchman, 1995); especially in this case, perception of digital art, halal investment, and trust investment. Moral legitimacy is usually studied by assessing whether the procedures, techniques, or organizational structures used to achieve results are the most appropriate in a moral sense. Organizational moral practices are motivated by managers' values, the values of the organization itself, or even by its strategic importance (Diez-Martin et al., 2019).

Our study examined moral legitimacy by determining whether individual perceptions of NFTs are influenced by moral, ideological, or philosophical values regarding the social utility of NFTs or blockchain technology. The authors hypothesize that entities able to receive moral values from large numbers of individuals will be capable of stimulating public engagement.

H1b: Moral legitimacy affects public engagement on NFT

2.1.3 Cognitive Legitimacy and Public Engagement on NFT

The third category of legitimacy relates to whether the actions or activities produced by an entity can be understood or not. Cognitive legitimacy is based on knowledge, not the results or actions required to achieve it. In particular, cognitive legitimacy arises from the evaluator's knowledge about the entity. An entity acquires this cognitive legitimacy when the evaluator feels that the organization is understandable and also when they understand how entities operate. Another way to gain cognitive legitimacy is when the evaluator assumes that it is unthinkable to do things any other way than using entities. The greatest degree of cognitive legitimacy is achieved when a new product, process, or service is deemed to have been defined and accepted by society for its operationalization (Diez-Martin et al., 2019).

In this case, cognitive legitimacy reflects whether the entity's performances are understandable. Cognitive legitimacy can be associated with the entrepreneurial creation of new entity values, resulting in an innovative understanding for the potential audience (Sabah & Kocak, 2016). Stakeholders should then keep track of the developments of such initiatives as the effects of legitimacy might develop later on once companies or industries have institutionalized value creation.

Cognitive legitimacy, as defined by Suchman (1995), is based on the evaluator's understanding of the entity being evaluated. When an evaluator finds an entity to be understandable, the entity's cognitive legitimacy increases. Cognitive legitimacy

can be obtained, for example, in the case of non-fungible tokens (NFTs), when people comprehend how NFTs function, which can lead to rational acceptance of these entities by individuals (Diez-Martin et al., 2019). Therefore, i n order to generate engagement with their products or services, it is essential for NFT creators and organizations to focus on establishing cognitive legitimacy.

H1c: Cognitive legitimacy affects public engagement on NFT

2.2 Corporate Image as Moderating Variable

The research results regarding the relationship between legitimacy and engagement are inconsistent. According to the findings of Shen and Sha (2020), the relationship between legitimacy and engagement has no significant impact. In contrast, Wuestewald's (2022) research revealed the exact opposite. According to Wuestewald's study from 2022, legitimacy has a significant impact on engagement.

In our study, we will use moderator variables to explain and elucidate the relationship between legitimacy and engagement. In this investigation, the proposed moderator variable is corporate image, or in our case, the NFT market exchange platform, engaged in NFT purchasing and selling transactions. We define corporate image as the public's perception of an institution or the totality of an individual's beliefs about it (Alessandri et al., 2006). The corporate image can be represented by its name, logo, tagline, color, previous customers, special offers, and public behavior (Alessandri et al., 2006).

Moreover, the notion of corporate image can be construed as a subjective perception held by an individual, encompassing the entirety of their knowledge, beliefs, emotions, and impressions pertaining to the company's activities, attitudes, services, brands, and products. Del-Castillo-Feito et al. (2020) posit that a favorable corporate image can enhance a company's level of acceptance and legitimacy. Consequently, it is hypothesized that the image of a cryptocurrency company may impact the association between NFT legitimation and public engagement in NFTs. The rationale behind the utilization of a crypto company lies in its provision of blockchain technology and cryptocurrency services, which serve as a means of exchange or currency for the purchase and sale of NFTs. Thus, the authors hypothesize that:

H2: Crypto company image moderates the relationship between NFT overall legitimation and public engagement on NFT

3 Method

This study uses a survey methodology to investigate legitimacy preferences that can lead to public engagement in NFTs and to determine the effect of crypto company image on the legitimacy process of public engagement in NFTs in Indonesia. This

research will use a quantitative approach. The research data was collected using a survey with a cross-sectional dimension (Sekaran & Bougie, 2016). The survey was conducted using an electronic questionnaire. Questionnaires were distributed from 20 April 2022 to 20 June 2022.

The sample selection method used is a non-probability sample selection method using a purposive type. The criteria for selecting subjects were respondents who had made transactions, both buying and selling, and those who had worked on NFT projects. The type of data used in this research is primary data. Data collection was carried out using a questionnaire instrument.

The questionnaire was developed based on measurements from (Miotto et al., 2020) for the legitimacy variable, (Kang, 2014) for the public engagement variable, and (Del-Castillo-Feito et al., 2020) for the corporate image variable. Legitimacy has 3 dimensions, namely: pragmatic legitimacy, cognitive legitimacy, and moral legitimacy. Public engagement has 3 dimensions, namely: affection commitment, positive affection, and empowerment. Corporate image has 2 dimensions, namely: cognitive image and affective image.

Questionnaires were distributed on various social media platforms that intersect with the NFT community, namely on Telegram, Instagram, Twitter, and Facebook. The communities participating in this survey are the Indonesian NFT community, NFT Promotion Creator, NFT Game Indonesia, Chat NFT, NFT Indonesia, Elders NFT, Cepod Kripto, Vexanium Blockchain, Indonesian NFT, Buy and Sell NFT, NFT Yogyakarta, NFT West Java, NFT Indonesian Marketplace, etc.

Data were analyzed using SEM PLS (Hair et al., 2014). The reason for the strength of SEM over alternative statistical analysis techniques lies in its inherent advantages. The utilization of structural equation modeling (SEM) offers the benefit of integrating two analytical methodologies, namely multivariate factor analysis and multiple regression analysis (Hair et al., 2014). The selected structural equation modeling (SEM) approach for this study is Variance-based SEM, specifically Partial Least Squares (SEM-PLS). The SEM-PLS analysis only consists of one stage: confirmation of the measurement model (outer model) and evaluation of the structural model (inner model) evaluation. Both run simultaneously by the software. However, evaluating the measurement model must still be done before evaluating the structural model. Before assessing the measurement model, it must ensure there are no missing values and outliers in the research data.

After confirming that there are no missing values and outliers, the next step is to evaluate whether the measurement model uses reflective or formative constructs. Then, testing the validity, reliability, and suitability of the research model fit. After confirming that the measurement instrument has validity and reliability and that the research model has suitability, the structural model evaluation is carried out. The structural model is evaluated to determine the results of the estimated path coefficient (β) and the significance value (P value), which will later be used in hypothesis testing.

4 Result

Utilizing the Google form function, a survey was conducted to collect data using a questionnaire in the form of an electronic questionnaire. From the research survey results, 155 respondents were willing to complete the questionnaire. The 108 respondents are respondents who know and transact (buy and sell) NFT; 36 respondents know NFT but have never bought and sold NFT; and as many as 11 respondents have never transacted or bought NFT. So the data processed in the system includes as many as 108 respondents. The 108 respondents found the following characteristics:

According to Table 1: Characteristics of Respondents, 65% of the respondents in this study who used NFTs were in the 20–30 age range. According to gender, men made up an astounding 95% of the respondents who used NFT in this study. This is made possible by the NFT market's rapid growth in the predominately male gaming and sports token trading industries. Based on the nature of their work, the majority of respondents in this study were students and business owners, comprising 21% and 20% of the total respondents, respectively. The final factor is then education. In this survey, those with a high school diploma or equivalent and a bachelor's degree are the majority.

Then the instruments in this study were tested using convergent validity as shown in Table 2, discriminant validity in Table 3, and reliability tests as depicted in Table 4.

Table 2 of Convergent Validity above shows that all questionnaire items from LP1-CA3 have a loading factor value above 0.5 and produce a significance p value <0.05 for first-order reflective measurements, as for the second-order formative measurement of legitimacy variable. The test results also show a significance value of p-value <0.05 and VIF value <2.5. Thus, it means that all question items in the questionnaire measured by reflective and formative measurements meet good convergent validity.

Table 3 Discriminant Validity shows the square root value of AVE (Average Variance Extracted) is highlighted in bold in the table. If the AVE value of the tested variable exhibits a stronger correlation than the AVE values of other variables, it satisfies the criteria for discriminant validity. Thus, it means that this research instrument has good discriminant validity.

Table 4 shows that all constructs in this study have a Composite reliability value of 0.7. So, it means that the instruments in this study have good reliability or have a good level of reliability or consistency. Before testing the hypothesis, the researcher conducts a goodness of fit test first to ensure that the model used in the study has a good goodness of fit.

Table 5 shows the APC and ARS values have a P value 0.05 and an AVIF value <5. It means that the model in the study has good goodness of fit. The Warp PLS algorithm is used to predict the relationship of each type of legitimacy to public engagement on NFT and to see the moderating effect on the relationship between the two. The results of testing each research construct are as follows.

Table 1 Characteristics of Respondents

Characteristics of Respondents	Number of Respondents	Percentage
Age		
<20	14	13%
20–30	70	65%
>30	24	22%
Total	108	100%
Gender		
Male	103	95%
Female	5	5%
Total	108	100%
Profession		
Graphic Design, *Content Creator, Digital Creator, Illustrator*	10	9%
Strategic Social Media, *Digital Marketing*	4	4%
Web Developer, Other Developer	5	5%
Writer, Content Writer, Art Director	2	2%
Freelancer	10	9%
Traders, Airdrops, Investors	6	6%
Government employees	4	4%
Private sector employee	14	13%
Photographer	2	2%
Self-employed	22	20%
Student	23	21%
Not Working and Only Trading NFT	6	6%
Total	108	100%
Education		
Junior High School	2	2%
Senior High School	59	55%
Vocational Degree	3	3%
Bachelor Degree	43	40%
Master Degree	1	1%
Total	108	100%

Source: own work

Based on Fig. 1, the results indicate that the p-value for Hypothesis 1a on the pragmatic legitimacy of public engagement in NFT is significant ($P < 0.05$). This indicates that hypothesis 1a is supported, which means that the pragmatic legitimacy of NFTs can influence public engagement in NFT Indonesia. In addition, the value of the path coefficient (β) is positive, which indicates that pragmatic NFT legitimacy has a positive effect on public engagement.

The p-value of hypothesis 1b moral legitimacy to public engagement in NFT is insignificant ($P > 0.05$) as shown in Fig. 1. This demonstrates that hypothesis 1b is therefore not supported. In other words, the public's engagement in NFTs is

Table 2 Convergent Validity

	Pragmatic Legitimacy	Moral Legitimacy	Cognitive Legitimacy	Public Engagement	Company Image	P value	VIF
PL1	(0.801)					<0.001	
PL2	(0.915)					<0.001	
PL3	(0.889)					<0.001	
ML1		(0.796)				<0.001	
ML2		(0.804)				<0.001	
ML3		(0.825)				<0.001	
CL1			(0.831)			<0.001	
CL2			(0.850)			<0.001	
CL3			(0.642)			<0.001	
AC1				(0.725)		<0.001	
AC2				(0.858)		<0.001	
AC3				(0.897)		<0.001	
PA1				(0.828)		<0.001	
PA2				(0.868)		<0.001	
PA3				(0.855)		<0.001	
PA4				(0.864)		<0.001	
PA5				(0.790)		<0.001	
E1				(0.634)		<0.001	
E2				(0.709)		<0.001	
E3				(0.743)		<0.001	
E4				(0.761)		<0.001	
E5				(0.769)		<0.001	
CI1					(0.823)	<0.001	
CI2					(0.753)	<0.001	
CI3					(0.847)	<0.001	
CI4					(0.871)	<0.001	
AI1					(0.886)	<0.001	
AI2					(0.793)	<0.001	
AI3					(0.840)	<0.001	
Lv_ PL						<0.001	1.306
Lv_ ML						<0.001	1294
Lv_ CL						<0.001	1273

Source: own work

unaffected by their moral legitimacy. In addition, the value of the path coefficient (β) is positive, indicating that the influence of NFT on public engagement in terms of moral legitimacy is positive.

In addition, Fig. 1 demonstrates a significant p-value for hypothesis 1c cognitive legitimacy to public engagement in NFT ($P < 0.05$). This therefore demonstrates

Table 3 Discriminant Validity

Construct	Pragmatic Legitimacy	Moral Legitimacy	Cognitive Legitimacy	Public Engagement	Company Image
Pragmatic Legitimacy	**(0.870)**	0.411	0.394	0.643	0.322
Moral Legitimacy	0.411	**(0.808)**	0.384	0.340	0.380
Cognitive Legitimacy	0.394	0.384	**(0.780)**	0.491	0.325
Public Engagement	0.643	0.340	0.491	**(0.796)**	0.301
Company Image	0.322	0.380	0.325	0.301	**(0.832)**

Source: own work

Note: The bold value in the table is the square root value of AVE (Average Variance Extracted). This value is obtained from the results of the discriminant validity test. The bold value is the AVE square root value of the variable being tested for its discriminant validity level. The AVE value of the variable being tested is compared with the AVE value of other variables

Table 4 Reliability

Construct	Pragmatic Legitimacy	Moral Legitimacy	Cognitive Legitimacy	Legitimacy	Public Engagement	Company Image
Composite Reliability	0.903	0.850	0.822	0.817	0.957	0.940

Source: own work

Table 5 Research Fit Model

Indicator	Indicator Value	Indicator P Value
APC	0.370	$P < 0.001$
ARS	0.430	$P < 0.001$
AVIF	1.052	

Source: own work

that hypothesis 1c is supported. In particular, the legitimacy of NFT affects the public's cognitive engagement with NFT. Moreover, the positive value of the path coefficient (β) indicates that the cognitive legitimacy of NFT has a positive effect on public engagement. The subsequent step is to evaluate the moderation of this model.

According to Fig. 2: Scatter Plot Effect on Crypto Corporate Image (a), the legitimacy relationship and public engagement in NFT will increase when the image of a crypto company is high. Moreover, in scatter plot b, the relationship between legitimacy and public engagement in NFTs will weaken when the crypto corporate image is low. However, the trend shifted at some point. The relationship between the two will not be affected by the crypto platform corporate image. Consequently, the corporate image of crypto platforms only influences the relationship between legitimacy and public engagement in NFTs during the market introduction phase.

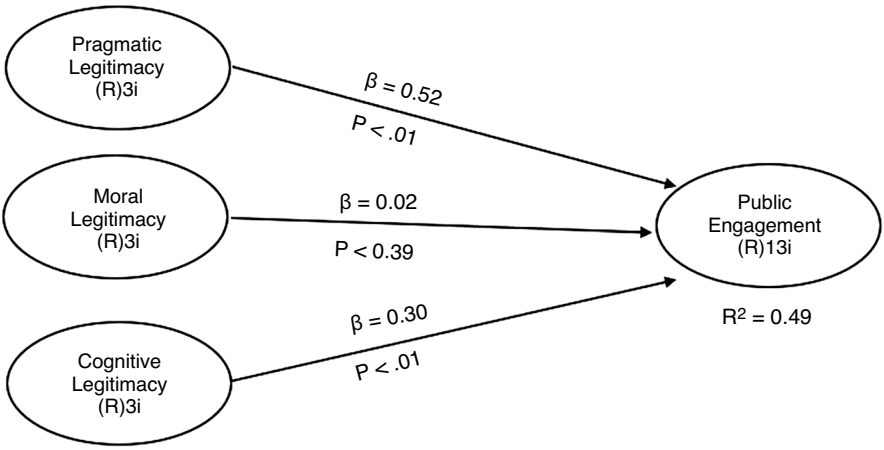


Fig. 1 Direct Effect. Source: authors own study

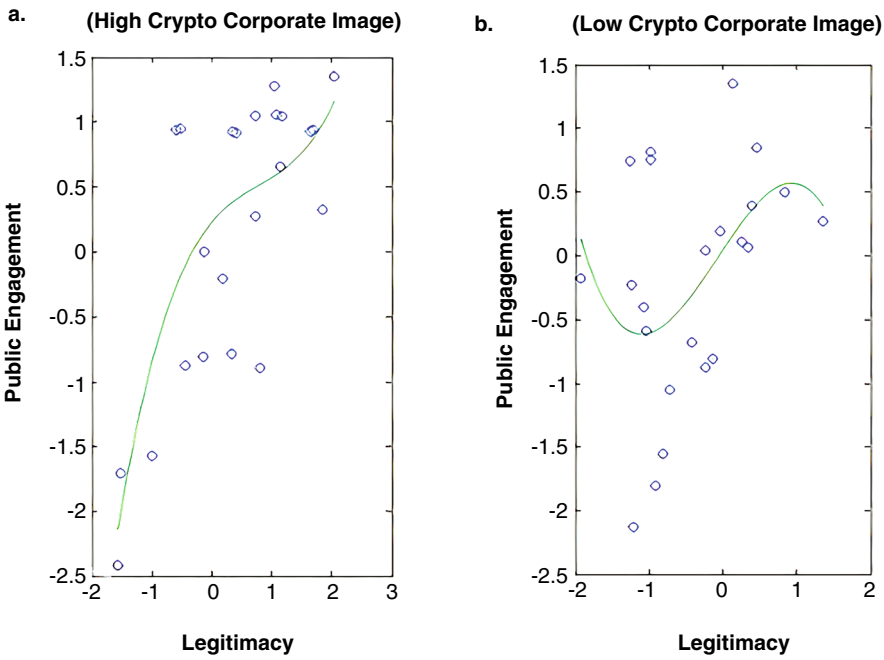


Fig. 2 Scatter Plot Effect on Company Image. Source: authors own study

5 Discussion

This research focuses on how the community can accept the social construct of the NFT (Non-Fungible Token) and how the community ultimately engages with it. It found that the pragmatic legitimacy of NFTs can influence public engagement in

supporting NFTs, as entities gain legitimacy when stakeholders achieve their goals through them. Based on our analysis, we have found a correlation between the level of engagement from the public with NFTs and their practical legitimacy. The higher the level of practical legitimacy, the more engaged the public is with NFTs.

This study aligns with prior research conducted by Leston-Bandeira (2014) and Wuestewald (2022), which posits that legitimacy has the potential to influence levels of public engagement. This study also aims to clarify the incongruous correlation between legitimacy and public engagement, as observed in the research conducted by Shen and Sha (2020) and Wuestewald (2022).

This study also found that, in general, individuals who engage in NFT are solely motivated by personal gain; if their goals are attained, then the individual can engage with an entity known as NFT. On average, respondents who have participated in NFT have a short-term investment horizon and do not give much thought to the commodity or instrument that will be used as a long term investment. Some respondents also only want to take short-term profits with the new commodity, NFT. Several additional respondents used this technology to create digital artwork and creators. However, whether respondents want to make quick money or be able to sell their artwork, music, videos, games, or traded utilities, their personal goals essentially determine how engaged they are with NFT entities.

Second, moral legitimacy refers to moral assessments of the actions of an organization or the operation of a specific entity. Moral legitimacy is different from pragmatic legitimacy. The goal of pragmatic legitimacy is to achieve results, while moral legitimacy focuses more on the methods to achieve these results. Entities that receive moral values from individuals en masse can generate public engagement with these entities. However, statistical data shows results that do not support this hypothesis. Because, in general, a person who engages in NFT does not care about the moral values obtained from the entity, they tend to disregard this entity's moral values and be pragmatic about the goals they wish to achieve by employing this entity. The results show that people tend to ignore moral legitimacy when it comes to NFT.

This study also uncovered novel findings: those who pragmatically legitimate an entity prefer to disregard its moral purposes because they tend to prioritize personal objectives satisfied by its existence. This conclusion is confirmed by a prior study undertaken by Islam et al. (2022), which demonstrates that moral legitimacy is actually capable of being in conflict with pragmatic legitimacy. Because moral legitimacy is pro-society legitimacy and tends to put the public interest and the general good of society first, while pragmatic legitimacy is the opposite and puts personal goals and interests ahead of the goals and good of society as a whole. Islam et al. (2022) say these two legitimacy can run simultaneously or are not contradictory if the public actively participates in encouraging the entity's development to be more advanced and developed in terms of the positive benefits for the community. In the context of NFT, active public engagement in both forums and movements promoting the use of NFT as a useful technology is not widely practiced at this time.

Third, cognitive legitimacy is based on knowledge, not on the outcomes or actions necessary to achieve it. Particularly, cognitive legitimacy derives from the

evaluator's knowledge of the entity being evaluated. An entity acquires this type of cognitive legitimacy when evaluators feel that the entity is understandable and when they understand how the entity operates. The capacity of entities to generate public engagement depends on the extent to which individuals can rationally accept them. The statistical results of the test contradicted this hypothesis, indicating that cognitive legitimacy influences public interest in NFT. In general, the public is engaged in NFT because of their knowledge of blockchain technology, how it works, the NFT buying and selling system, and the benefits of NFT technology for the art industry, digital creators, and digital games.

This study also examines the value of these three types of legitimacy's most significant influence. Pragmatic legitimacy and then cognitive legitimacy have the greatest impact of the three previously mentioned types of legitimacy.

Fourth, a positive corporate image will increase the company's acceptance and legitimacy. Consequently, it is predicted that the image of a crypto company can influence the relationship between the legitimacy and acceptance of an NFT and the public's engagement in NFT. hypothesis demonstrates that statistical data are insignificant. Even though the multicollinearity test failed, the statistical data could still show that the corporate image variable is a moderating variable, since the VIF value doesn't show any signs of multicollinearity. The researchers thus did further analysis using a scatter plot. From the results of the scatter plot analysis, it was found that the image of the company/exchanger affects the relationship between legitimacy and public engagement at the beginning of the NFT introduction process. The scatter plot image shows that when the image of the company or exchange is really low on the relationship between legitimacy and engagement, it will reduce the relationship between legitimacy and public engagement. Still, at a certain point when the company's image has begun to be known by the public, the effect on the relationship of legitimacy and engagement is not too influential. Conversely, when the company's image is high, the relationship between legitimacy and engagement will increase. Still, at a certain point, when the crypto company has begun to be known by the public, the relationship between legitimacy and public engagement will not be as strong as when the crypto company was not yet known.

Findings were also made about why the image of crypto/exchanger companies did not change the relationship between legitimacy and public engagement after the introduction process. This is because, in general, people who have engaged with NFT and have used NFT for a long time tend to think of using another crypto company or exchange in the process of buying and selling NFT. Due to the fact that each company charges different transaction fees, the general public tends to compare the crypto company or exchanger they have used to others that charge lower transaction fees.

6 Conclusion

This study aims to examine how the NFT acceptance process in Indonesia leads to public engagement in this entity, as well as the factors that may strengthen or inhibit this process. On the basis of the research conducted, it can be inferred that

pragmatic and cognitive legitimacy play a crucial role in shaping the process of public involvement in Indonesia regarding NFT. Then, the reputation of crypto firms is a factor that can help or hurt this process. The legitimacy process of public engagement on NFT in Indonesia is driven by the reputation of crypto firms, particularly at the beginning of the NFT process in Indonesia.

New findings indicate that pragmatic legitimacy is contrary to moral legitimacy. If a person gives the entity practical legitimacy, that person does not give the entity moral legitimacy. It is because both are different concepts; pragmatic legitimacy is legitimacy based on the goals they want to achieve, while moral legitimacy is more about the process used to achieve these goals.

This research makes a practical contribution by showing that it is important for governments and crypto companies to pay more attention to the process of good education, namely about the NFT system, how blockchain works, secure trading systems, and the positive benefits of NFT, both for artists, digital content creators, entrepreneurs, communities, and event organizers, to be able to achieve higher adoption rates of this technology.

Another practical contribution is that it is also important for crypto companies to maintain a positive corporate image in the eyes of the public. This research has answered some of the gaps in the research problems related to NFT. It adds to what is known about NFT, especially when it comes to legitimacy, public engagement, and the effect of crypto corporate image on NFT in Indonesia. It also provides a discussion of the process of acceptance of NFT by the community using three perspectives of legitimacy. This study contributes to the continuation of the research by Pinto-Gutiérrez et al. (2022) regarding the process after the community is willing to accept and enter the NFT market, namely engaging with an entity called NFT. It also contributes factors that can explain one of the reasons for the inconsistency between legitimacy and engagement.

Besides the contributions, this research also has some limitations and makes some suggestions for future research. This study only accommodates the legitimacy variable as the antecedent variable of public engagement. Future research can include other variables that can be antecedents of public engagement. This study only accommodates the moderating variable, namely the image of crypto companies, that can influence the relationship between legitimacy and public engagement on NFT. Future research can also examine the community's image or NFT developer, which may be a moderating variable influencing the relationship between legitimacy and public engagement with NFT. Future research can also distinguish the legitimacy between digital creators, investors, NFT artists, and NFT developers. Furthermore, future studies will be able to identify differences between each NFT, such as variances in the legitimacy of NFT digital art in the form of photos, movies, and music, NFT games, and NFT utilities.

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More Than 10 Years of Blockchain Creation: Where Are We Now?



Khalid Ahmed Al-Ansari and Ahmet Faruk Aysan

Abstract To identify how blockchain technology affects current and future research, we carried out a bibliometric overview of journal articles written on blockchain in finance, economics, and social sciences fields. We aimed to answer some of the questions and visualize publications' trends regarding the advancement of blockchain utilization in the selected fields. We used the Scopus database for the literature research, which resulted in 506 papers by 1278 authors distributed across 79 countries. The data showed that from 2008 till 2021, publishing about blockchain was more significant among conference papers than journal articles by a factor of two. The bibliometric analysis showed the importance of citation regarding published academic articles, the influential authors, the top universities/organizations with blockchain research, and the top countries of articles' publications on blockchain topics. The study identified Financial Innovation as the most impactful journal, the National Natural Science Foundation of China as the leading funding sponsor on blockchain research, the USA as the highest publication-producing country, and Hong Kong as the top country in the average citation per document produced. Finally, the study analysis identified the 20 most cited articles on blockchain topics from 2008 to early 2021. This study's investigation and findings could set a preliminary understanding and a road map for those interested in carrying out a bibliometric analysis on any topic.

Keywords Blockchain · Bibliometric analysis · Citation impact · Co-citation · Authors' network

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1 Introduction

Blockchain is poised to become the most exciting invention after the internet (Zhao et al., 2016). While the internet connects the world to enable new business models based on online business processes to flourish, blockchain will help resolve the trust issue more efficiently via network computing (Zhao et al., 2016).

One of the most generally accepted definitions for blockchains is that they are distributed public ledgers or meta-technologies (i.e., technologies made up of several technologies) (Hughes et al., 2019). Blockchain technology was originally introduced to the global community via Bitcoin (Tandon et al., 2021). Blockchain was initially used as a cryptographic mechanism for disseminating bitcoin and associated cryptocurrency transactions (Tandon et al., 2021) to solve the mistrust between transacting parties, known as the double-spending problem (Ante, 2020). Blockchain's applications across multiple sectors, such as supply chain management and the Internet of Things, to name a few, have seen rapid growth in the past 5 years (Tandon et al., 2021). Other applications that experienced growth due to the spread of blockchain technology include healthcare, digital identity, personal data, energy markets, government, voting, law, contracts, and the sharing economy (Ante, 2020).

According to Conway (2020), blockchain is a database that varies from traditional databases in how it keeps information. Conway demonstrated how blockchain saves data in blocks chained together and how new data is inserted into a new block as it arrives. Conway said that once the block has been filled with data, it is chained onto the previous block, chaining the data together chronologically. Conway demonstrated that a blockchain could store several types of information, but the most prevalent application has been as a transaction ledger. Conway further explained that blockchain is decentralized in Bitcoin's case so that no single person or group has control, and instead, control is retained collectively by all users. Finally, Conway claimed that decentralized blockchains are immutable. Immutability means that the data entered is irreversible (Zhao et al., 2016). In the example of Bitcoin, this means that all transactions are forever recorded and can be viewed by anybody.

This study shows the research done on the topic of blockchain in selected subject areas: finance, economics, and social science. Therefore, the study's relevance to the literature sheds light on those subject areas. Hopefully, this study will inspire further research on blockchain in other subject areas, such as engineering and computer science, to complement the findings of this study.

In this bibliometric study on published articles on the selected topics of blockchain, we initially attempted to answer some of the questions that would enable the reader to visualize the trend of academic publications regarding the advancement of the use of blockchain. Further on, this study will concentrate on blockchain articles published for finance, economics, and social sciences. Our study reflects our interest in showing blockchain publications' impact on the business and finance sectors. Other sectors, such as engineering and computer science, deserve another dedicated bibliometric study.

The study investigates whether or not writing about blockchain in finance, economics, and social sciences subjects is progressive or glorified. The study strives to

answer the following question: as more innovative approaches related to the utilization of blockchain start to emerge, will there be more scholarship about this technology in the future? The bibliometric analysis will also compare the impact of countries such as the United States of America (USA), China, and Germany, to name a few, on blockchain research and publication. Furthermore, this paper will evaluate the quality of the publications using the number of citations from other papers given to an article. We used the average citation to assess the relative significance of the article (Azer, 2015).

The first extracted data showed that conference papers about blockchain exceeded what had been produced in journal articles and books. This high number of conference papers reflects conference organizers' interest in the topic. The conference papers were filtered out from the search criteria to concentrate on journal articles. Similarly, this study found that computer science was the main subject area of blockchain publication, and we had to filter that out from extracted dataset. The initial extracted data also showed that China leads the publishing sector in the topic of blockchain, which indicates China's high support for blockchain technology. The USA took the lead in publishing blockchain articles when the search filters excluded articles written in a language other than English. The study also found that the trend of publications on the topic of blockchain is increasing annually at a progressive rate. It showed the top 20 blockchain articles with the most impact measured by the average citation indicator. In addition, this study showed that Hong Kong generated larger citation counts for articles published within it than the USA. Furthermore, the study revealed that the University of Surrey in the UK is leading other universities globally in citations for articles about blockchain topics produced by universities.

A unique study like ours can guide new researchers' bibliometric analyses in any field. The results of most bibliometric studies were presented in tables and graphs without explanations of how the results were obtained. There is a lack of an in-depth explanation of how the analysis was carried out and how the results were interpreted. We recognized this lacuna during the literature review of this study. We addressed this lacuna by providing a detailed outline that provides a framework from which to learn and apply the concepts of bibliometric analysis. Other studies that addressed the theoretical background of bibliometric analysis are based on (de Carvalho et al., 2020); (Bornmann et al., 2020); (Robinson-Garcia et al., 2019) and (Perianes-Rodriguez et al., 2016). We anticipate that this study will provide the future researcher with first-hand information that will make it easier to locate resources for the literature review stage. The researcher will also identify the influencing countries, top authors, and top universities focusing their research on blockchain topics, which can help facilitate further research.

The outline of this paper is as follows: Sect. 2 will explain the methodology and the different tools used in the analysis. Section 3 will give an overview of the blockchain topic articles. In contrast, Sect. 4 will present the authors' analysis and discuss the authors' statistics, networks, funding organizations, publishing organizations, and publishers' countries. The paper presents the 20 most cited articles in the preselected fields of blockchain. Section 5 will summarize the obtained results and recommend future research areas.

2 Methodology and Data

Bibliometrics is a quantitative analysis method that uses mathematical and statistical tools to measure the inter-relationships and impacts of publications within a given area of the research (Lee et al., 2020). Bibliometric analysis (BMA) unveils pivotal articles and objectively illustrates the linkages between and among articles about a particular research topic or field by analyzing how many times they have been co-cited by other published articles (Fetscherin & Usunier, 2012).

The BMA makes a vital contribution to the literature, as it outlines, structures, and identifies the key institutions, journals, articles, and authors, as well as research streams in linkage to the research (Fetscherin & Heinrich, 2015). Zhang (2020) divided the process of BMA into four modules:

1. Data acquisition: Data sources from database and web data, with manual or automatic acquisition methods.
2. Data preprocessing: This is mainly format conversion and filtering of the data that does not meet the requirements.
3. Statistical calculation: can be divided into annual growth statistics and other related statistics.
4. Application analysis.

Accordingly, we modeled the study to align with those modules. We selected Scopus as a reputable source for data acquisition (Elsevier, 2021). The acquisition method was manual by specifying the search keyword in Scopus. Due to the database's extraction limitations (as stated earlier), the study selected filters (such as subject areas, document types, and English language) that removed unsuitable data. The study performed the statistical calculation and analysis using VOSviewer and Biblioshiny software packages.

Scopus, over the years, has earned its equal place as a comprehensive bibliographic data source, and it has been proven reliable and, in some respects, even better than Web of Science (Pranckutė, 2021). Journal coverage in Scopus is more comprehensive than in Web of Science (Agarwal et al., 2016), which was the reason for choosing this database. Moreover, as the blockchain topic is scientific, it would be appropriate to search databases with scientific data. The Scopus database provides the most comprehensive overview of the world's research output in science, Technology, Social Sciences, Arts and Humanities, and Medicine (Agarwal et al., 2016).

This study used two software to analyze the extracted data from Scopus. The first software is VOSviewer, a tool for constructing and visualizing bibliometric networks (CWTS, 2021). Those networks may include journals, researchers, or individual publications. The networks can be created based on citation, bibliographic coupling, co-citation, or co-authorship relations. The second software is Biblioshiny, an open-source tool for executing a comprehensive science mapping analysis of scientific literature (K-Synth Srl, 2016). The types of analysis included are the publication year, subject area, publication type, countries, authors, and organizational affiliations. Extracted data from the database were uploaded into each software to assess the network information.

We extracted data by searching for blockchain in Scopus database source with filters including documents written in English and all types of documents (conference papers, articles, conference reviews, book chapters, and reviews). We found 18,567 documents covering all years since 1984. This large number of records cannot be extracted from the database, as the Scopus database will only allow the extraction of the first 2000 documents' information. Upon examination, we found that there has been a consistent increase in blockchain publication since 2013 (2 documents), 2014 (11 documents), 2015 (40 documents), 2016 (177 documents), 2017 (783 documents), 2018 (2923 documents), 2019 (5851 documents), 2020 (7749 documents). We do not doubt that the trend of publishing on the topic of blockchain is increasing, as shown in Fig. 1. Further examination of the extracted data shows that the published documents cover ten main subject areas.

The most significant subject of the publication is computer science, with 12,557 documents (35.7%), followed by engineering as the second largest publication area, with 6833 documents (19.4%). Decision science was the third most significant subject area, with 3333 documents (9.5%), as depicted in Fig. 2.

In examining the type of publications, the initial extracted information from the database showed that conference papers are the most significant type, with 60.9%. In comparison, journal articles came in the second position with 34.2% of the total published oeuvres, as depicted in Fig. 3.

Regarding the publications' countries, we see that China comes in the first position with 4138 documents, and the USA comes in the USA second position with 2445 documents. India, the United Kingdom (UK), and Germany come in the following places with 1682, 1005, and 712 documents, respectively, as depicted in Fig. 4.

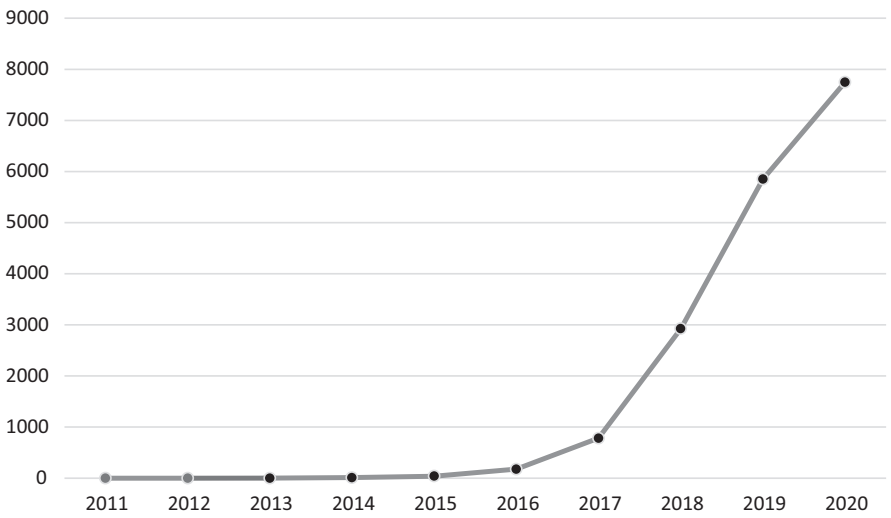


Fig. 1 Documents on Blockchain Topics Published by Year. Source: Own work based on Scopus search output

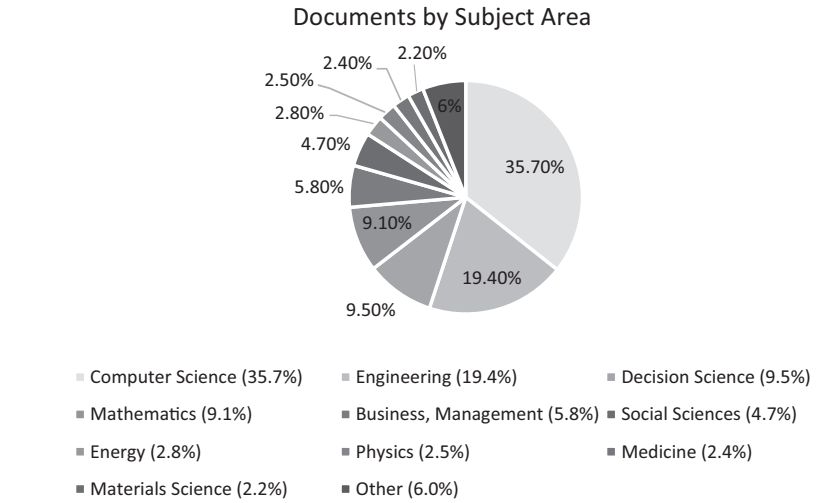


Fig. 2 Documents Published by Subject Areas. Source: Own work based on Scopus search output

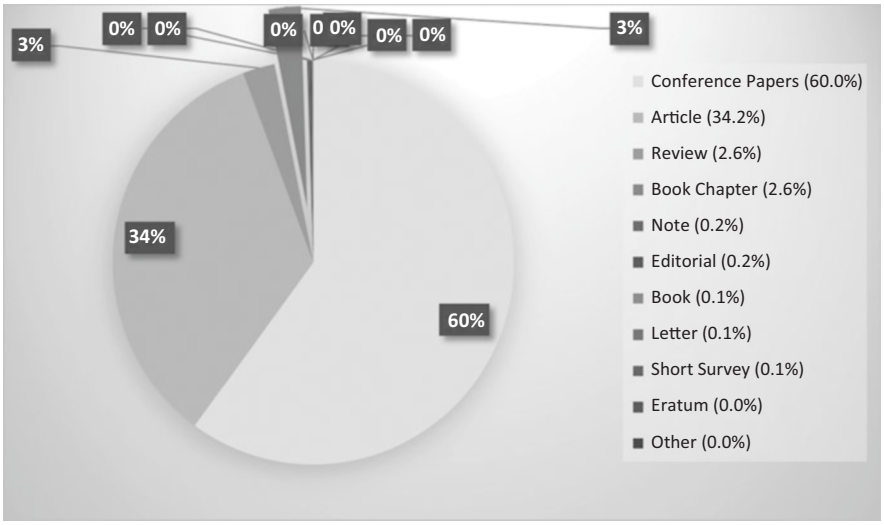


Fig. 3 Documents Published by Type. Source: Own work based on Scopus search output

2.1 Data Filtering

The initial finding was that the documents in sizable portions are conference papers (10,141), conference proceedings (8354), and articles written in the English language (18,001). However, this large number of documents may include documents from trade journals, books, and book series which are not peered-reviewed as journal articles. Hence, we are interested mainly in journal findings as a source type. A

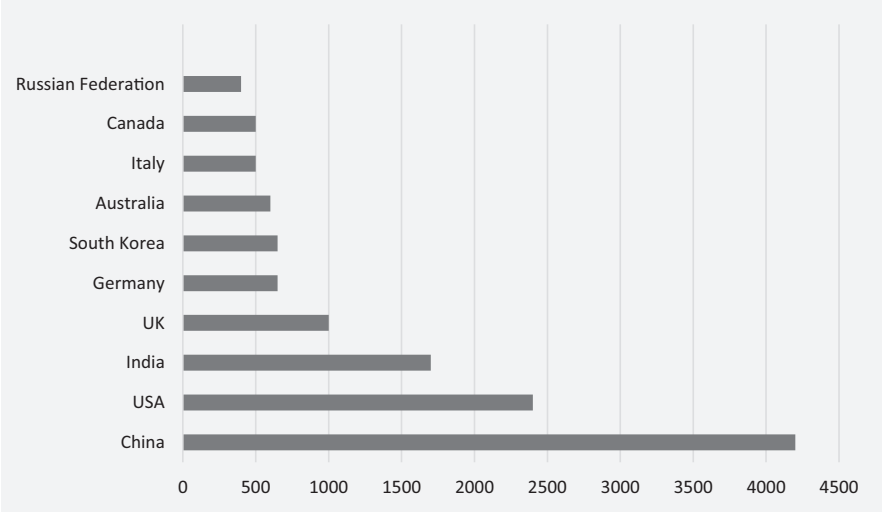


Fig. 4 Documents Published by Countries. Source: Own work based on Scopus search output

refined search in the database source limited the results to those articles from journals written in English, resulting in 4895 documents.

As the main focus of this study is to explore the published articles on the topic of blockchain in finance, economics, and social science, we defined a search query that combined terms limiting the search to those topics. This filtered data eliminated documents from unrelated subject areas such as nursing, immunology, chemistry, computer science, and chemical engineering. The resulting data with the keyword 'blockchain' were 506 documents (as of Thursday, 18 March 2021).

2.2 Bibliometric Analysis of the Keywords

We identified the filtered results of 506 documents on blockchain in the Scopus database for all the years (from 1984 to 2021). The published documents in 2020 were 237 articles, more than double what was published in 2019 (with 105 articles). We extracted the data in March 2021; therefore, only published articles from the first quarter of 2021 were recorded (i.e., 58 articles). Since 2015, however, the number of published articles in the selected areas of finance, economics, and social science has increased yearly.

As shown in Fig. 5, the filtered result changed the percentage of documents by subject area compared to the initial search. Economics, Econometrics, and Finance lead the way with 301 articles (22.6%). Business, Management, and Accounting rank second with 275 articles (20.6%), followed by Social Science with 260 articles (19.5%), Environmental Science with 152 articles (11.4%), and Energy with 145 articles (10.9%). Decision Science had 38 articles (2.9%), while the Arts and Humanities had 43 (3.2%).

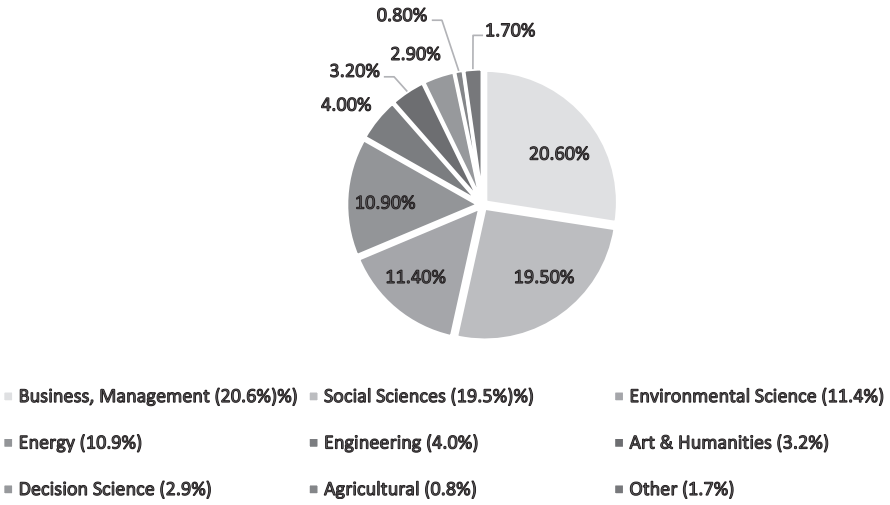


Fig. 5 The Subject Area Sectors (Filtered Results). Source: Own work based on Scopus search output

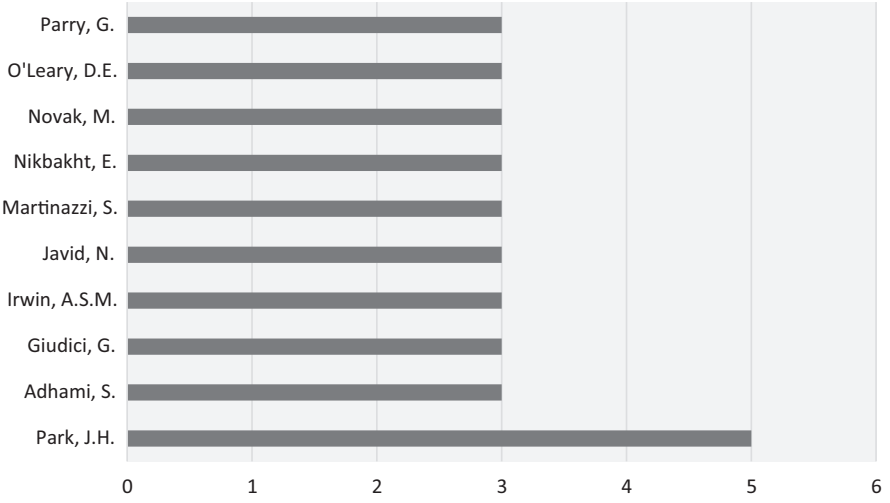


Fig. 6 The Authors with a Minimum of 3 Articles. Source: Own work based on Scopus search output

Finally, as depicted in Fig. 6, the filtered result shows that Park has the most published articles (5). Adhami, Guidici, Irwin, Javid, Martinazzi, Nikbakht, Novak, O'Leary, Parry, Turner, and Vismara, on the other hand, have all written three articles.

3 Overviews of Blockchain Topic Articles

3.1 Number of Publications by Year

After the refined search, we got 506 documents showing the same increasing trend in publications yearly. We got this result as identified in the Scopus database for all the years since the start of publishing articles about blockchain. In 2020, there were 237 published articles, more than the 105 published in 2019. The observed trend is that the number of written articles increases yearly.

3.2 Publication by Publishing Sources

As a threshold, our study used a publishing source's minimum of five published documents on the topic of blockchain. VOSviewer calculated 24 publishing sources out of 177 that met this threshold. A list of the first 15 publishing sources is sorted in Table 1 by the highest average citations. Table 1 illustrates that, despite having

Table 1 Top 10 Publishing Sources Sorted Based on Highest Average Citations

Publishing Source	*Documents*	*Citations*	*Average Citation*	*Total Link Strength*
Financial Innovation	*7*	*425*	*60.7*	209
Intelligent Systems in Accounting, Finance and Management	6	265	44.2	313
Decision Support Systems	5	153	30.6	165
Strategic Change	*14*	*387*	*27.6*	656
Sustainable Cities and Society	10	272	27.2	411
International Journal of Production Economics	9	195	21.7	689
Electricity Journal	4	57	14.3	109
International Journal of Accounting Information Systems	6	64	10.7	218
Small Business Economics	8	78	9.8	587
Journal of Open Innovation: Technology, Market, And Complexity	6	49	8.2	386
Journal of Legal, Ethical and Regulatory Issues	5	36	7.2	88
Sustainability (Switzerland)	*88*	*623*	*7.1*	3464
Energy Research and Social Science	5	32	6.4	179
International Journal of Digital Accounting Research	5	29	5.8	338
Journal of Industrial and Business Economics	3	17	5.7	147

Source: Data extracted from VOSViewer

only seven publications, Financial Innovation received 425 citations, with an average of 60.7. This is the highest average number of citations. This observation indicates that Financial Innovation's publications on blockchain topics are high-quality documents that researchers frequently cite.

Furthermore, Table 1 reveals that, although some publishing sources produced more documents than Financial Innovation (and thus received more citations), the quality of those documents is unconnected to the number of publications. For example, Sustainability (Switzerland) has published 88 papers with 623 citations. Nonetheless, the average citation for Sustainability is only 7.1, which does not qualify this source to be in the top ten leading positions.

3.3 Network Map

The bibliographic coupling technique assesses the occurrence of a standard reference to a particular document in the bibliographies of two or more publications, lending more insights into the current and prospective research boundaries of a particular subject matter (Tandon et al., 2021).

Using bibliographic coupling in VOSviewer with authors as units of analysis and a minimum of three publications per author, 18 out of 1278 authors met the thresholds, as shown in Fig. 7.

3.4 Citation Map Based on Publication Countries

This part presents the countries involved in blockchain research and publication as indicated by the author's country recorded in the publications (Firdaus et al., 2019). Citation analysis generally assesses and evaluates a publication's acceptance level via a quantified assessment of its reference by other published reports (Tandon et al., 2021). This analysis assists in understanding the influence and popularity of individual documents and the collaborative network of citations (Tandon et al., 2021). The citation map uses a co-citation mapping technique to visualize how

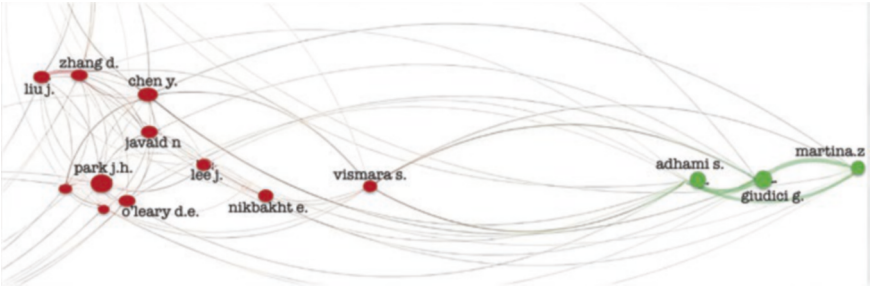


Fig. 7 Authors' Network and Clusters. Source: VOSViewer output screenshot

articles are co-cited and cited reciprocally over time (Fetscherin & Heinrich, 2015). For the required mapping, we used a threshold of five documents as a minimum publication for a country (of the 79 countries) to qualify to be part of the network map, and 36 countries met this threshold. Those 36 in the network are not all connected, and the most extensive set of related items consisted of 34 countries.

The resulting network map showed that citations from the USA are connected with all the countries except Lithuania, Cyprus, and Ukraine. In contrast, Lithuania is connected to Italy and Canada, while Cyprus is connected to the Netherlands, the UK, Australia, and Germany. Ukraine is shown to have connections only with UK and Germany.

From Tables 2 and 3, we can see that the USA is leading citations with 1014 citations, seconded by the UK with 709 citations. China had 640 citations, while Germany and South Korea had 395 and 297 citations, respectively.

According to Table 2, despite Germany and South Korea having roughly the same number of publications (42 and 40 documents, respectively), Germany's publications received 395 citations compared to South Korea's 297 citations. This finding indicates that German publications had a more significant influence on later authored articles than South Korean publications.

3.5 Number of Documents by Country

Compared with Fig. 4, the filtered research changed the percentage of published articles by country, where the United States leads with 92 published articles, as seen in Fig. 8 below. The UK has 59 published articles; China has 50 published articles;

Table 2 Highest Countries Production (Sorted Citations)

Country	Documents	Citations	Total link strength
United States	92	1014	145
United Kingdom	59	709	144
China	50	640	77
Germany	42	395	106
South Korea	40	297	51
Australia	31	279	30
Italy	28	247	119
Canada	12	222	56
Hong Kong	7	204	10
France	10	130	36
Romania	6	117	20
India	15	108	23
Netherlands	15	107	39
Belgium	12	97	58
Poland	8	89	4

Source: Data extracted from VOSViewer

Table 3 Countries Produced Documents' Citations

Country	Documents	Percentage (%)	Citations	Average citation per document	Total link strength
United States	92	15.3	1014	11.0	145
United Kingdom	59	9.8	709	12.0	144
China	50	8.3	640	12.8	77
Germany	42	7.0	395	9.4	106
South Korea	40	6.7	297	7.4	51
Australia	31	5.2	279	9	30
Russian Federation	31	5.2	77	2.5	5
Italy	28	4.7	247	8.8	119
India	15	2.5	108	7.2	23
Netherlands	15	2.5	107	7.1	39
Belgium	12	2.0	97	8.1	58
Canada	12	2.0	222	18.5	56
Spain	12	2.0	32	2.7	7
Switzerland	12	2.0	83	6.9	10
France	10	1.7	130	13.0	36

Source: Data extracted from VOSViewer

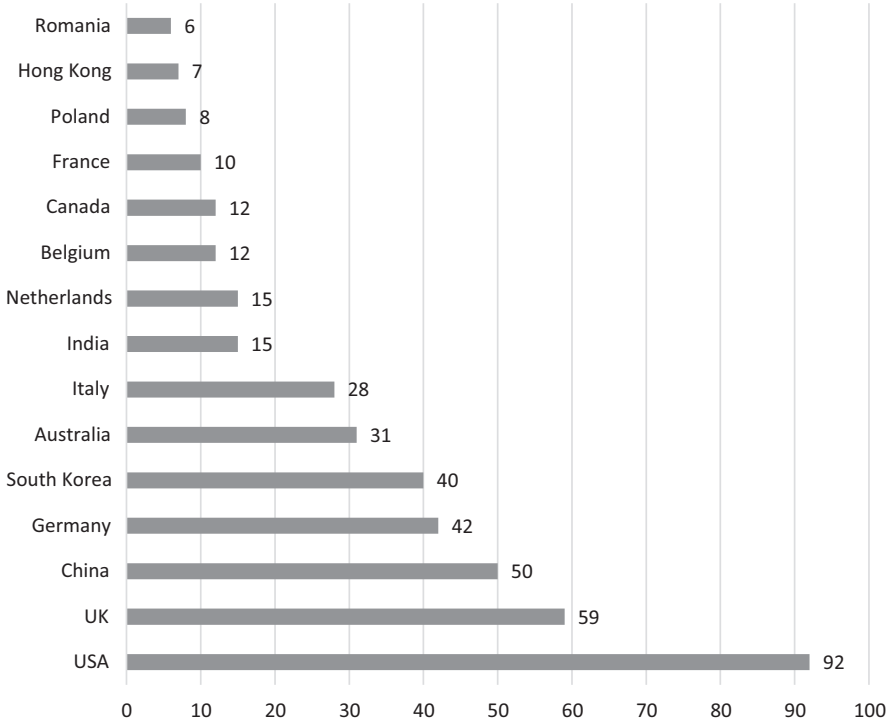


Fig. 8 Highest Publishing Countries. Source: Own work based on Scopus search output

Germany has 42 published articles, almost the same as South Korea with 40 published articles. Australia and Russian Federation have 31 published articles, followed by Italy with 28 published articles. India and Netherlands both have 15 published articles.

The examination of citations per country (by not selecting the option in VOSviewer to exclude papers co-authored by a significant number of nations), with a minimum of 5 documents by a country, resulted in 36 of the 79 countries meeting the threshold. According to Table 3, the USA has the most blockchain publications, with 92 papers producing 1014 citations. The UK follows suit, with 59 articles yielding 709 citations. China ranked third with 50 publications producing 640 citations, Germany ranked fourth with 42 publications producing 395 citations, and South Korea ranked fifth with 40 publications producing 297 citations.

According to Table 4, Hong Kong had the most significant average citation per document, with a score of 29.1, despite publishing just seven documents that resulted in 204 citations. Romania (19.5) and Canada (18.5) finished second and third, respectively. France (13.0) and China (12.8) finished fourth and fifth, respectively.

Although France had produced only ten documents, it had 130 citations and an average citation of 13. In comparison, China produced 50 documents with 640 citations and an average citation of 12.8. The higher number of average citations gives France publications a higher impact in the field. We discovered that the average citation per document is the caliber that may be used to distinguish high-quality prominent articles from those that are not. According to this assessment, despite having the most publications (92 documents), the USA ranked eighth in terms of publishing quality.

Table 4 Countries' Average Citation Per Document

Country	Documents	Percentage (%)	Citations	Average citation per document	Total link strength
Hong Kong	*7*	1.2	*204*	*29.1*	10
Romania	6	1.0	117	19.5	20
Canada	12	2.0	222	18.5	56
France	*10*	1.7	*130*	*13.0*	36
China	*50*	8.3	*640*	*12.8*	77
The UK.	59	9.8	709	12.0	144
Poland	8	1.3	89	11.1	4
USA	*92*	15.3	*1014*	*11.0*	145
Germany	42	7.0	395	9.4	106
Singapore	8	1.3	75	9.4	6
Australia	31	5.2	279	9	30
Saudi Arabia	7	1.2	63	9.0	16
Italy	28	4.7	247	8.8	119
Ireland	9	1.5	77	8.6	20
Pakistan	8	1.3	66	8.3	15

Source: Data extracted from VOSViewer

4 Analysis of Authors

4.1 Document Number by Authors

According to Table 5, Adhami had just three papers published but had the most citations (150) and the highest average citation (50), closely followed by Giudici, who had the same number of documents but fewer citations (149) and a lower average citation (49.7). Table 5 shows that Park had a higher number of 5 documents published but fewer citations (47) and a low average citation score (9.4).

4.2 Authors Network

We employed co-authorship as a form of analysis, using authors as a unit of analysis and a minimum of three documents per author. The thresholds were satisfied by 18 of the 1278 authors.

4.3 Authors' Funding Organizations

Although the data on funding organizations may not have been harmonized in Scopus data and may not have a consistent format, we see from Fig. 9 that the leading funding organization is the National Natural Science Foundation of China. The National Research Foundation of Korea came in the second position. The third

Table 5 Authors with 3 Articles or More

Author	Documents	Citations	Average citation	Total link strength
Adhami S.	*3*	*150*	*50.0*	218
Giudici G.	3	149	49.7	274
Martinazzi S.	3	136	45.3	192
Li X.	3	134	44.7	68
Parry G.	3	97	32.3	18
O'Leary D.E.	3	82	27.3	31
Irwin A.S.M.	3	49	16.3	78
Park J.H.	*5*	*47*	*9.4*	29
Vismara S.	3	44	14.7	59
Javaid N.	3	40	13.3	20
Lee J.	3	32	10.7	21
Chen Y.	4	18	4.5	56
Novak M.	3	18	6.0	30
Liu J.	3	17	5.7	80
Turner A.B.	3	11	3.7	77
Wang D.	3	3	1.0	52
Nikbakht E.	3	2	0.7	5
Zhang D.	3	2	0.7	88

Source: Data extracted from VOSViewer

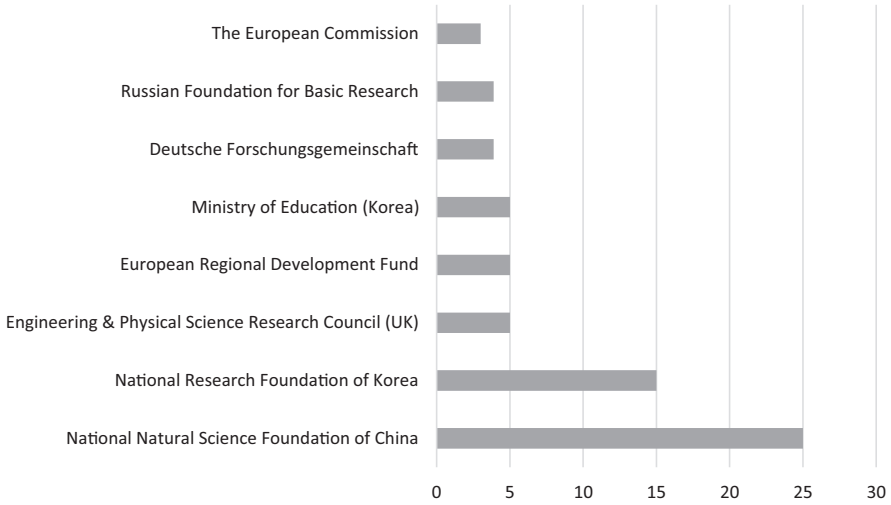


Fig. 9 The Funding Organizations. Source: Own work based on Scopus search output

position is shared by three organizations, the Engineering and Physical Science Research Council (UK), the European Regional Development Fund, and the Ministry of Education (Korea). The fourth position is shared between Deutsche Forschungsgemeinschaft and Russian Foundation for Basic Research. The European Commission came in the fifth position.

4.4 Authors' Publication Organizations

For researching and publishing organizations such as universities, we used co-authorship as a type of analysis. The study used organizations as a unit of analysis (full counting) and three documents produced by the organization as a minimum number. The study got five out of 1007 organizations that met the thresholds, as depicted in Table 6 below.

According to Table 6, the University of Surrey (UK) has three publications that generated the most citations per publication. The University of Southern California (USA) has the same amount of publications as the University of Surrey, but it had fewer citations per publication, indicating that the University of Surrey has marginally more significant publications. This result is visible in the size of the density visualization in Fig. 10, with the University of Surrey having the largest circle compared to the other universities.

4.5 Authors' Citation

The analysis for author citations utilized a minimum threshold of three documents by an author, yielding 18 authors out of 1278 that satisfied this threshold (as seen in Table 7).

Table 6 The Average Citations for The Articles Produced by Organizations

Organization	Documents	Citations	*Average citation*	Total link strength
University of Surrey, UK.	3	87	29	2
University of Southern California, Los Angeles, CA, USA	3	82	27	0
University of the West of England, UK.	3	79	26	2
Department of computer science, Comsats University Islamabad, Islamabad, 44000, Pakistan	3	40	13	0
Department of security studies and criminology, Macquarie University, Sydney, Australia	3	21	7	0

Source: Data extracted from VOSViewer

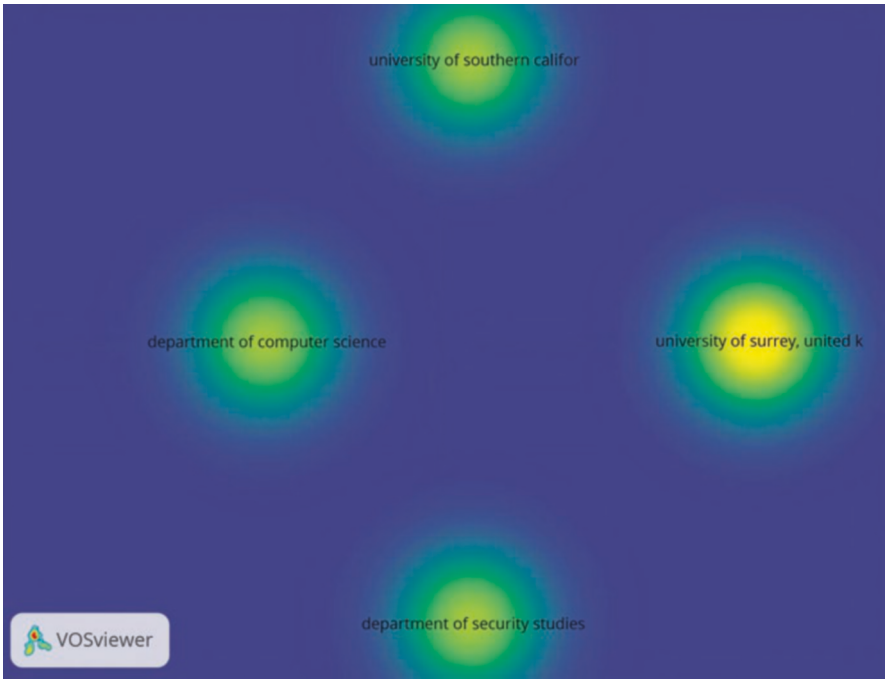


Fig. 10 The Density Visualization of Universities. Source: VOSViewer output screenshot

For published articles, the study showed that Park is leading the most published authors with five articles, followed closely by Chen with four articles, and Adhami with three articles. However, although Adhami had produced the average number of 3 articles, his articles were cited the most with 150 citations, followed closely by Giudici, with 149 citations. Adhami and Giudici's papers had better quality and research information based on citations. We also found that the picture of which author publishes more quality papers cited by other authors differs when the study

Table 7 Author's Documents and Associated Citations

Author	Documents	*Citations*	Total link strength
Adhami S.	*3*	*150*	12
Giudici G.	*3*	*149*	13
Martinazzi S.	*3*	*136*	11
Li X.	3	134	2
Parry G.	3	97	0
O'Leary D.E.	3	82	0
Irwin A.S.M.	3	49	2
Park J.H.	*5*	*47*	0
Vismara S.	3	44	8
Javaid N.	3	40	0
Lee J.	3	32	0
Chen Y.	*4*	*18*	1
Novak M.	3	18	0
Liu J.	3	17	0
Turner A.B.	3	11	2
Wang D.	3	3	1
Nikbakht E.	3	2	0
Zhang D.	3	2	0

Source: Data extracted from VOSViewer

analysis sets the minimum number of articles published (e.g., reducing the threshold from 3 to 2 articles per author, as illustrated in Fig. 11).

It is not surprising that Nakamoto (2008) has an enormous box signifying the most extensive citation, as shown in Fig. 12, because Satoshi Nakamoto was the one who initiated the white paper on the blockchain topic. Furthermore, we notice that primarily three groups cite each other (each color representing one cluster in Fig. 12). In addition, we can also see that there are predominantly 3 clusters that mention each other (if seen in color, then each color represents one cluster).

4.6 Authors' Countries

When VOSviewer analysis used the criteria of authors' countries with a minimum of 5 articles, 36 countries met this threshold out of 79 countries. However, when we reduced the criteria to 3 articles per authors' countries, 48 countries out of the 79 countries met the threshold.

This analysis showed that the USA has the highest number of publications of 92 documents, seconded by the UK with 59 documents, followed by China with 50 documents. Germany and South Korea are close to each other, with 42 and 40 documents, respectively. Australia and Russian Federation share the same position with 31 documents. However, Australia had more citations (279 compared to 77). Table 8 below shows this information, and similar to earlier findings, the number of publications each country produces does not indicate the quality and impact. However,

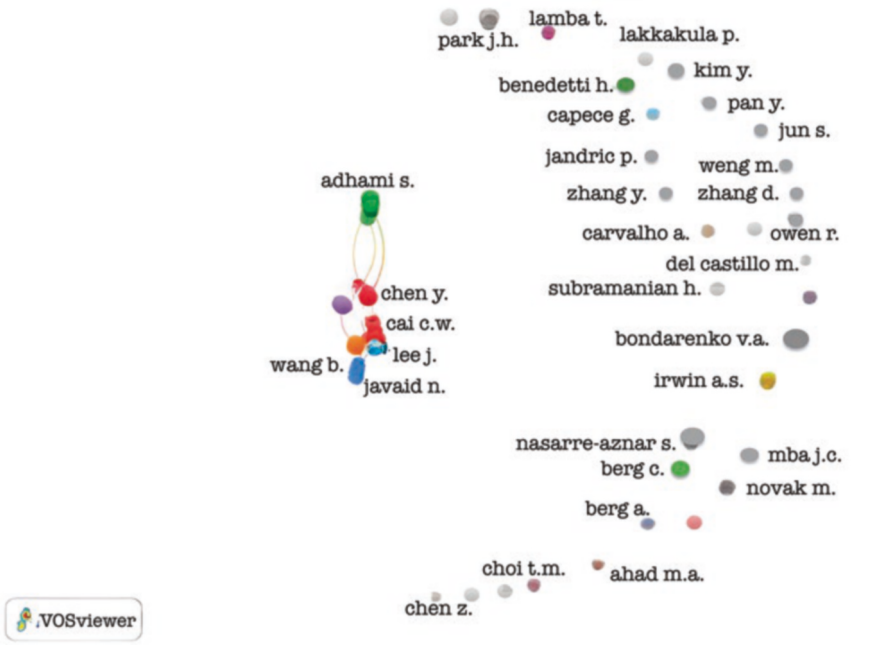


Fig. 11 Authors and Co-Authors' Relationship of The Researchers Who Are Working on the Blockchain Topics (Notes: Authors who have published at least two articles were considered). Source: VOSViewer output screenshot

instead, it is the cited publications by other authors worldwide. A noticeable example is that both Australia and Russian Federation produced 31 documents but the citations that Australia's documents have raised 279 citations compared with 77 citations raised by the Russian Federation's documents.

In addition, Fig. 13 shows each country's number of publications, and the larger the box, the higher the number of publications. We can see clearly that the USA and UK are leading. We can see the more significant density in the USA, UK, and China, which is no surprise when evaluating Table 8.

4.7 Collaboration Between Countries

Figure 14 shows the collaboration network between countries working and cooperating on blockchain research. Figure 14 shows 30 different clusters (originally differentiated in colors). The UK collaborates the most with other countries as its cluster includes numerous other countries, including European Countries and others such as Turkey, Australia, and more. It also shows that Australia collaborates mainly in its cluster with

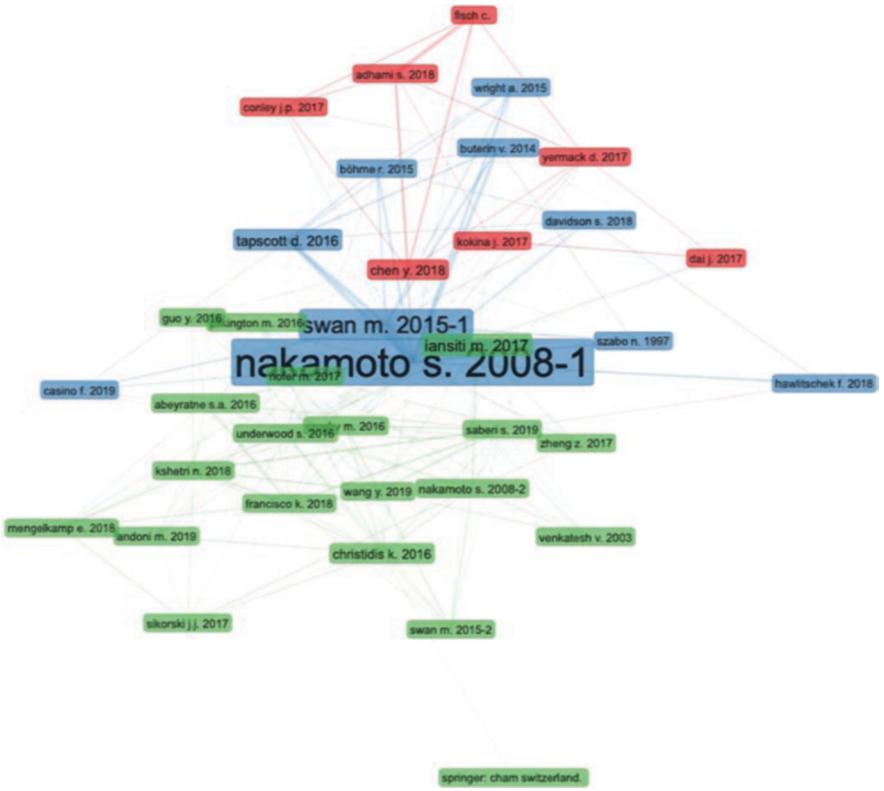


Fig. 12 Co-Citation Network. Source: Biblioshiny output screenshot

Table 8 The 25 Countries Producing Highest Citations

Country	Documents	Citations	Total link strength
United States	92	1014	9878
United Kingdom	59	709	8157
China	50	640	4867
Germany	42	395	7489
South Korea	40	297	4375
Australia	31	279	2706
Italy	28	247	4739
Canada	12	222	2674
Hong Kong	7	204	596
France	10	130	2556
Romania	6	117	933
India	15	108	2129
Netherlands	15	107	2553
Belgium	12	97	2026

(continued)

Table 8 (continued)

Country	Documents	Citations	Total link strength
Poland	8	89	848
Switzerland	12	83	1387
Russian Federation	*31*	*77*	1021
Ireland	9	77	1622
Singapore	8	75	730
Hungary	3	68	218
Pakistan	8	66	1301
Saudi Arabia	7	63	1261
Ukraine	9	43	226
Norway	4	42	1462
Spain	12	32	1376

Source: Data extracted from VOSViewer

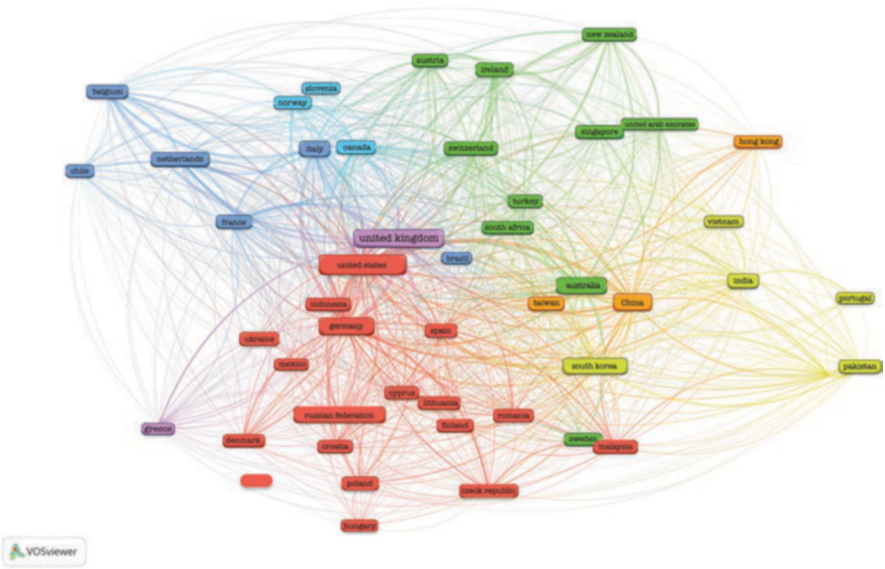


Fig. 13 Countries Publications Network Map. Source: VOSViewer output screenshot

New Zealand and India and with countries outside its cluster, such as the UK and China. The USA collaborates with other clusters with more collaboration within its cluster (i.e., cluster 1), including Canada, Mexico, Chile, Colombia, and Croatia. This collaboration can be seen in Table 9 below, which shows each cluster's members. We can visualize the collaboration between countries as the highest in clusters 1 and 2.

The collaboration of authors' countries can be seen in Fig. 15, where we can see the collaboration lines. The country color represents the number of publications, the darker the color, the more publications the country has. This finding of the collaboration between countries is consistent with what was observed in earlier paragraphs.

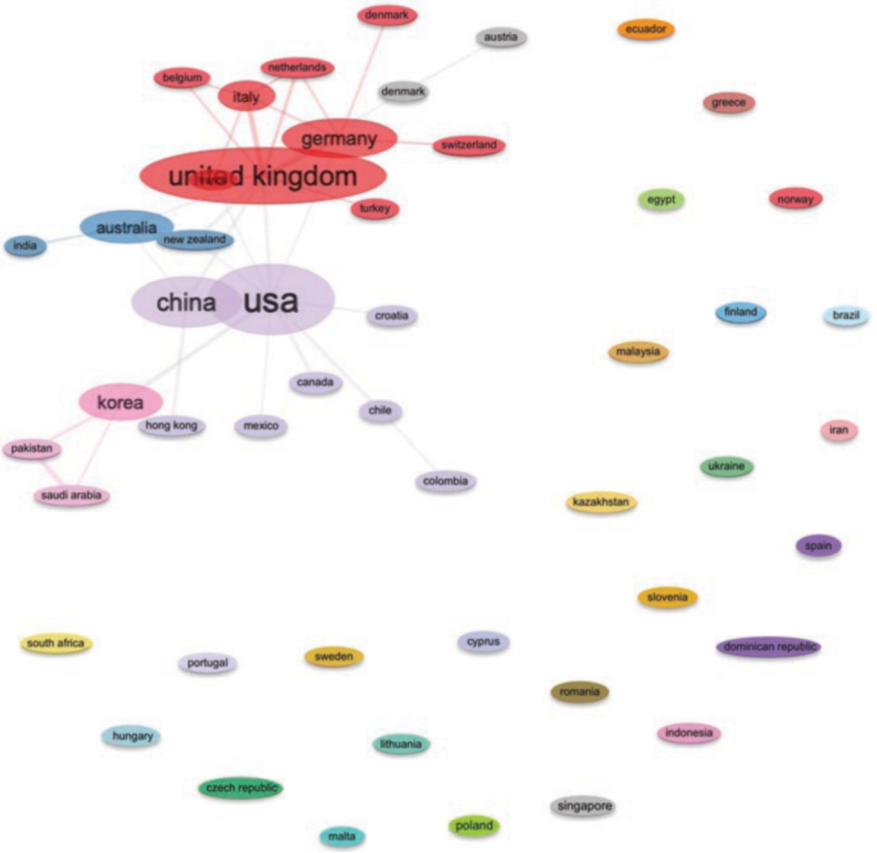


Fig. 14 Collaboration between Countries (Overall). Source: Biblioshiny output screenshot

Table 9 Highest 20 Collaborating Countries Network

ID	Node	Cluster	Betweenness
1	*UK.*	1	126.5
2	*Germany*	1	49.3
3	*Italy*	1	2.7
4	Netherlands	1	0.0
5	Switzerland	1	0.0
6	Turkey	1	0.0
7	*France*	1	1.6
8	Belgium	1	0.0
9	Denmark	1	0.0
10	*Australia*	2	23.3
11	India	2	0.0
12	*New Zealand*	2	3.0

(continued)

Table 9 (continued)

ID	Node	Cluster	Betweenness
13	Ukraine	3	0.0
14	Spain	4	0.0
15	Malaysia	5	0.0
16	Romania	6	0.0
17	*Korea*	7	44.0
18	Pakistan	7	0.0
19	Saudi Arabia	7	0.0
20	Singapore	8	0.0

Source: Data extracted from VOSViewer

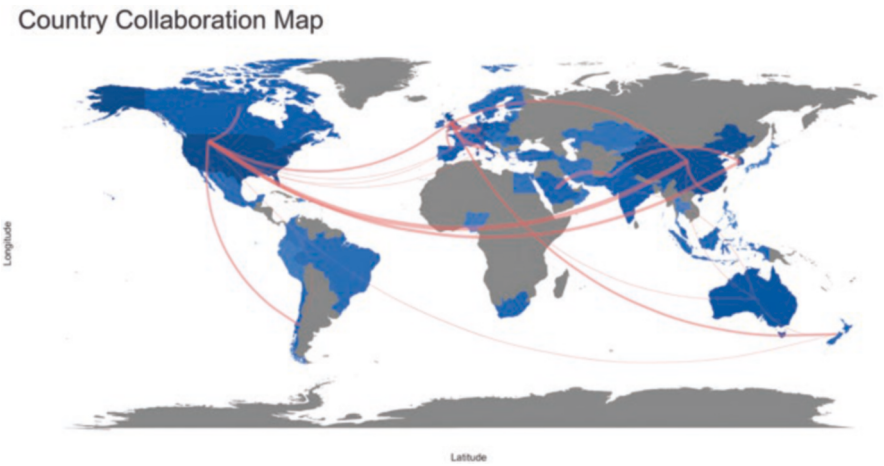


Fig. 15 Map of Country Collaboration. Source: Biblioshiny output screenshot

4.8 Most Cited Documents Network

Table 10 lists the 20 most cited titles, the publishing journals, the authors, and the total citation for each title. Table 1 showed that Financial Innovation is in the first position, with a title that raised 189 citations. It was also in the 13th, 14th, and 16th positions with other titles. We also note that collaborating authors write 19 out of those 20 titles. This observation aligns with the growing number of co-authorships per paper and the continual decline in the self-citation rate, which benefit the topic of blockchain applications.

Table 10 Most 20 Global Cited Documents

#	Paper	Title	Total citations
1	Sun J, 2016, Financial Innov	Blockchain-based sharing services: What blockchain technology can contribute to smart cities	189
2	Kim Hm, 2018, Intell Syst Account Finance Manag	Toward an ontology-driven blockchain design for supply-chain provenance	182
3	Dagher Gg, 2018, Sustainable Cities Soc	Ancile: Privacy-preserving framework for access control and interoperability of electronic health records using blockchain technology	168
4	Adhami S, 2018, J Econ Bus	Why do businesses go crypto? An empirical analysis of initial coin offerings	135
5	Li X, 2017, Decis Support Syst	The technology and economic determinants of cryptocurrency exchange rates: The case of Bitcoin	132
6	Wang Y, 2019, Int J Prod Econ	Making sense of blockchain technology: How will it transform supply chains?	105
7	Warner Ksr, 2019, Long Range Plann	Building dynamic capabilities for digital transformation: An ongoing process of strategic renewal	95
8	Kouhizadeh M, 2018, Sustainability	Blockchain Practices, Potentials, and Perspectives in Greening Supply Chains	87
9	Shermin V, 2017, Strateg Change	Disrupting governance with blockchains and smart contracts	71
10	Wu J, 2018, Sustainability	The invisible politics of Bitcoin: governance crisis of a decentralised infrastructure	70
11	De Filippi P, 2016, Internet Policy Rev	The invisible politics of Bitcoin: governance crisis of a decentralised infrastructure	69
12	Nowiński W, 2017, Entrep Bus Econ Rev	How Can Blockchain Technology Disrupt the Existing Business Models?	68
13	Xu Jj, 2016, Financial Innov	Are blockchains immune to all malicious attacks?	68
14	Wang H, 2016, Financial Innov	A maturity model for blockchain adoption	65
15	O'leary De, 2017, Intell Syst Account Finance Manag	Configuring blockchain architectures for transaction information in blockchain consortiums: The case of accounting and supply chain systems	63
16	Cai Y, 2016, Financial Innov	Fraud detections for online businesses: a perspective from blockchain technology	58
17	Fu B, 2018, Sustainability	Blockchain Enhanced Emission Trading Framework in Fashion Apparel Manufacturing Industry	51
18	Scott B, 2017, Strateg Change	Exploring the rise of blockchain technology: Towards distributed collaborative organizations	50
19	Li Z, 2019, Electr J	Blockchain for decentralized transactive energy management system in networked microgrids	49
20	Dierksmeier C, 2018, J Bus Ethics	Cryptocurrencies and Business Ethics	49

Source: Biblioshiny output

5 Conclusion & Recommendation

After more than 10 years of inventing blockchain technology, the scientific community has been continuously writing about this technology in different fields where the technology can be used and applied. From cryptocurrencies to smart contracts to smart cities and sustainability, this paper explored all the areas tackling blockchain and involved analyzes, evaluation, and innovative blockchain usages that would increase efficiency, trust, and cost savings. Economy and finance have been prime movers in advancing applications using the blockchain.

Before conducting the bibliometric analysis, the initial search found that subject areas of the publications in blockchain had been led by Computer Science and followed by Engineering, Decision Science, and Mathematics. Conference papers also led the type of publications in blockchain in the majority, while article types are the second in position. Publication production in the blockchain has been led by China, followed by the USA, India, UK, and Germany (in sequence). However, this ranking changed when we applied filters in the database to business and economics; the publication language is exclusively English, and the publication type is journal articles only. We observed apparent shifts in the numbers and countries' rankings. However, one constant was that the number of publications in journal articles addressing blockchain continued to rise year after year, as evidenced by the first search and the results after we applied the filters.

The bibliometric analysis showed that the top authors are not only those who produce several publications but those whose publications generate a higher number of citations. This is the same finding that our study showed earlier with the publications by organizations or journal publishers. The number of average citations per document published gave the organization a higher standing, not just the number of publications. The importance of citations and average citation per document clarified not only the most cited publication and the top organization but also showed the top countries producing reputable quality publications in the field of blockchain. With the additional filtering applied to the search from the database source, the result showed that the USA became the leader of journal publications on blockchain technologies topics. An interesting finding that the bibliometric analysis showed was that Hong Kong generated fewer papers than the USA but still, those papers generated larger citation counts, making Hong Kong lead the countries. The study also showed by using the citation findings that the University of Surrey in the UK led other universities in the USA, the UK, Pakistan, and Australia. The final finding of this study was the 20 most cited publications about blockchain based on the total citations that each had generated.

It is noteworthy to mention that this study was based on data extracted from 1980 to March 2021, however, the documents registered in the database showed publications about blockchain in the subject areas starting only in 2013. One of the limitations of this study is that the data extracted is restricted to Scopus articles that are peer-reviewed in English language. The second limitation is that the study focused on finance, economics, and social science articles that dealt with blockchain. The

third limitation is that the analysis is based on published articles up to March 2021, and thus recent articles will not be part of the study analysis time frame. However, this time frame limitation can be rectified by taking a new dataset from Scopus and analyzing it as we did in the paper. The final limitation is that the software used in the bibliometric analysis has limitations. We would like to point out that the Scopus data extraction limit of 2000 records was irrelevant to our extracted dataset, but researchers should know this. Scopus has acknowledged this limitation of its search interface. In other databases (e.g., Web of Science), it is possible to manually extract more than 2000 articles from a database.

One of the contributions this study make is that it can be used as a road map to import new up-to-date search results and then use the bibliometric software to analyze the data. The study's limitations were acknowledged in the introduction section; therefore, those must be addressed in future research.

Our recommendation for future research is to study blockchain tracking applications in humanitarian fields such as aid delivery and sustainable development goals' achievements.

The authors of this study believe that this work will be a valuable starting point for any future bibliometric research on any topic, particularly the field of blockchain. The given analysis and outputs can be used as background information to give the researcher a starting point in the literature survey before embarking on the research journey.

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Part V
Eurasian Economic Perspectives: Education

A Definition-Led Structure for Capturing Third Mission at Higher Education Institutions: A Case Study of a German University of Applied Sciences



Georg Westermann and Carolin Schubert

Abstract Along with their activities in research and education, Institutions of Higher Education (HEI) are increasingly urged to co-operate and exchange with their non-academic environment. Moreover, the UNESCO World Action Program on ESD states that universities take over social responsibility by transferring knowledge into society. The continuum of those Third Mission Activities (TMA) contains part-time education as well as contract research, cultural, ecological and social engagement or the solution of problems of regional companies or public institutions. In that context HEI and their decisionmakers should be able to identify and structure those heterogeneous activities as a first step in order to control them as efficiently as research and education. In this paper a literature-based definition of TMA is presented and applied to develop a three-dimensional structure in which TMA might be systemized and evaluated. The tool is then applied to the case of a German University of Applied Sciences and its 167 heterogenous TMA. The data are collected in two waves of interviews with 57 providers of TMA at this institution. The results demonstrate that the suggested approach can deliver a systematic picture of the Third Mission landscape within a specific HEI. Moreover, in this case study it is shown that it is possible to structure the variety of 167 TMA detected at a HEI according to the goal systems of HEI. Applying the proposed tool can be the starting point to structure, evaluate and compare the TMA of a HEI in order to increase both their effectivity and efficiency.

Keywords Capturing third mission activities · Higher Education Institutions · Heterogeneity · Case study

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1 Introduction

Within the last years Institutions of Higher Education (HEI) face a rising pressure to focus more and more on contributing solutions to practical problems of their surrounding societies as a third task added to their original obligations in research and education (see Hachmeister et al., 2016, see Compagnucci & Spigarelli, 2020). Those contributions towards the society (see Abreu et al., 2016) can comprise a wide range of activities. Continuing education, contract research, cultural and social engagement or the solution of regional practical problems might serve as examples for these activities. This phenomenon is often called the third mission of universities alongside with research which is called the first mission and education as the second mission (see Hachmeister et al., 2016; see Krainer & Winiwarter, 2016; see Roessler et al., 2015). Schneidewind (2016) claims that this third task of universities is crucial as third mission activities (TMA) are a tool for shaping the HEI's profile in order to gain recognition, budgets, researchers and students.

The aim of this investigation is to introduce and to test an approach that enables HEI leaders to apply the Third Mission concept in a way that represents their individual and often multi-dimensional goal-systems. A first step towards this task is to account for the number of activities and their content as well as their organization, resource consumption and the achieved efforts (see Hachmeister et al., 2016). Considering these topics many projects and publications have been brought forward in recent years (see Stifterverband, 2018; see Stifterverband, 2019; see Roessler et al., 2015; see Henke et al., 2016; see Kornek et al., 2021). Nevertheless, a workable tool for the above-mentioned goal-oriented management of TMA cannot be found in the literature. "In particular, there is a lack of any cohesive methodology for the evaluation of a TM … because measurement systems are inadequate … or undeveloped and usually fail to assess the successes of a university in carrying out TM initiatives." (Compagnucci & Spigarelli, 2020, p. 15).

Systematic capturing as well as the evaluation of TMA are pivotal for controlling these extremely heterogenous activities and the former shall be addressed in the following. More specifically, the overall aim of and motivation for this paper is to demonstrate that a concept of structuring the portfolio of TMA can be systematically developed from its definition and is helpful in order to enhance management decisions and activities towards strategic goals of a HEI. To accomplish this task a workable and literature-based definition of TMA is applied to distinguish TMA in a case study at a German University of Applied Sciences from other activities of this HEI. In a first wave 57 problem-centred interviews—analysed by qualitative content-analysis—revealed the intentions, goals and structural elements of 167 TMA meeting the above-mentioned definition. Complementary data regarding the consumption of HEI resources by the TMA were collected in an additional case study with a sub-sample of the first interview wave. Here, 29 TMA were investigated in more depth.

The results of the case study demonstrate that it is possible to deliver a systematic picture of the Third Mission landscape for a structured TMA-portfolio of a HEI

as the starting point for goal-oriented evaluation and controlling of those heterogenous activities (see Westermann & Schubert, 2023 for a complementary evaluation approach).

The paper starts with a description of the theoretical considerations and steps taken to get from a literature-based and operational definition to a systematic structure of a TMA portfolio in Chap. 2. Subsequently, this concept is tested in a case study where Chap. 3 depicts the design and data of the case study while Chap. 4 concludes with the results regarding the possibilities for the systematization of the HEI's TMA applying the suggested three-dimensional structure and compares the results to the findings of other investigations. The paper concludes with a discussion of the implications of the results for future evaluation possibilities of TMA in Chap. 5.

2 From an Operational Definition to a Systematic Structure of Third Mission Activities

This section proposes a workable definition of Third Mission and derives from this a systematology to map the TMA performed in a HEI. In recent research a variety of different und sometimes overlapping definitions of Third Mission can be found (see Jongbloed et al., 2008; see Vorley & Nelles, 2008; see Berthold et al., 2011; see Pasternack & Zierold, 2015; see Compagnucci & Spigarelli, 2020; for an analysis see Boden et al., 2019). For the purpose of this empirical study these definitions are not fully appropriate as they often fail in differentiating TMA exactly from other activities (i.e., first and third mission) of HEI. Following Boden et al. (2019), a more operational definition is applied to identify TMA. Hence, activities are considered Third Mission Activities when they actively shape the non-academic environment, consume institutional resources and are associated with higher education core activities such as education and research or the strategic goals of the respective HEI.

The definition allows a huge variety of HEI activities performed by many different participants with heterogeneous goals to be subsumed under the term TMA. Moreover, it provides three constitutional dimensions (with various subcategories) of those activities:

1. Aims (research, teaching, strategy)
2. Inputs (variety of consumed resources)
3. Output (how the activity influences the environment)

As a consequence, the systematic approach to create clusters of TMA containing comparable activities can utilize this three-dimensional definition (see Fig. 1). Thus, TMA are first distinguished according to the respective HEI mission (i.e., research, education or strategic objectives) they can be assigned to. As a second dimension the inputs consumed during a TMA are applied for classification. The HEI typical differentiation between own funding and third-party funding serves as a first

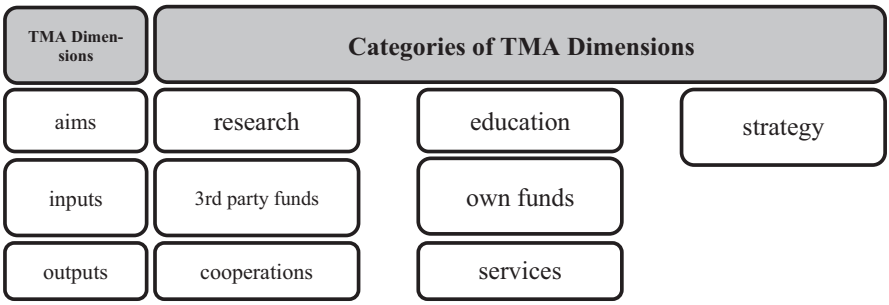


Fig. 1 Third Mission Classification. Source: own illustration

Table 1 From Third Mission Definition to Third Mission Classification

Third Mission Definition	Dimensions and Sub-Categories
activity is linked to the core processes education, research or the strategic goals	*Dimension 1: aims* • research • education • strategy
activity consumes HEI resources	*Dimension 2: inputs* • third-party funding • own funding
design of the activity shapes the non-academic world	*Dimension 3: outputs* • cooperation • service

Source: own work

approximation that can be refined during the investigation. Finally, the resulting design delivered by the TMA in order to shape the non-academic environment is used. It is obvious that the two superficial output categories "cooperation" and "service" can also be differentiated into further "HEI products". Table 1 shows the three dimensions and some respective HEI typical sub-categories. According to this approach every single TMA could then be clearly assigned to one of 12 possible combinations of the seven sub-categories.

While Fig. 1 shows a generic graphical representation of this approach Fig. 2 illustrates as an example how a specific TMA "X" might be categorized in a cluster as "research oriented", "funded by third-party" and providing "a service to the society".

At the end of this paper's conceptual paragraph three remarks on possible difficulties during the empirical implementation of the approach shall be made. A first challenge seems to be that the assignment of a single TMA into the sub-categories of this classification can be difficult when elements of two or more sub-categories in one dimension appear to be present at the same time. As a matter of simplification, it is suggested here to classify a TMA exclusively in the most predominant sub-category of a dimension. Secondly, it is obvious that there exists a kind of

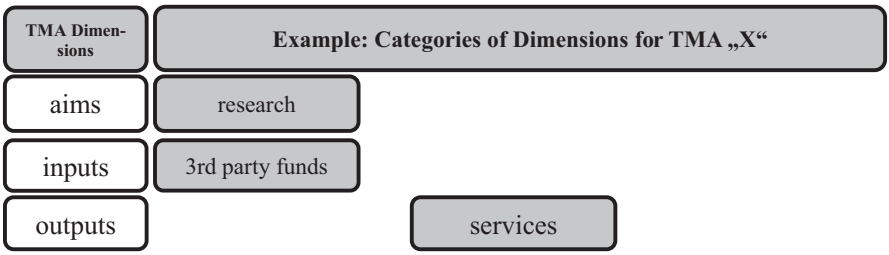


Fig. 2 Example for Third Mission Classification. Source: own illustration

"path-dependency" with respect to the sequence of the three dimensions applied. Starting with the aims of a TMA as the first dimension followed by inputs and then by outputs is only one possible angle to shed some light on the portfolio of a HEI's TMA. The empirical case study in the subsequent paragraphs will demonstrate that—depending on the purpose of an investigation—various sequences of the three dimensions might provide helpful insights. Finally, it might be necessary to further differentiate the sub-categories into sub-sub-categories (and so forth) in order to dig deeper into the structures of an HEI's TMA. The dimensions "aims", "outputs" and "inputs" together with their sub-categories will serve as examples for this approach in some of the following paragraphs.

3 Design of the Case Study: Empirical Investigation and Data

The empirical investigation presented here was designed to systematically record the TMA at the Harz University of Applied Sciences in Germany and also provide insights into the objectives or aims pursued by the identified stakeholder groups. In order to account for as many of the TMA as possible in the period from 2018 to 2019, research reports, module and unit descriptions, project websites and other documents were analyzed. All university employees, who could be assumed to have performed TMA, were invited to a first brief interview.[1] If at least one activity corresponded to the above provided definition of Third Mission, the person received the invitation to an extensive personal interview, which was audio-documented, transcribed and then analyzed both qualitatively and quantitatively (see Mayring, 2015; see Bauer & Blasius, 2019). These problem-centered interviews (see Witzel, 1985) should shed some light among other things on the number, the characteristics, the target groups, the goals and possible success measures of the respective TMA

[1] As all university members participated voluntarily in the interviews, there was—according to the regulations of the institution—no need for the approval of an ethical committee. Nevertheless, content and structure of the interviews have been checked for compliance with data protection regulations.

Table 2 Interviews at Harz University of Applied Sciences

Interviews by organizational unit	Number of interviews	Fraction in %	Number of TMA	Fraction in %
Automation & Computer Science	21	37%	56	33%
Administration Sciences	9	16%	31	19%
Management & Economic Science	25	44%	74	44%
Student initiatives	2	3%	6	4%
Total	57		167	

Source: own work

Table 3 Interviews at Harz University of Applied Sciences

Interview Waves	Main Content	Period	Number of TMA
Wave 1	TMA characteristics	2018/19	167
Wave 2	TMA inputs	2021/22	29 (sub-sample of wave 1)

Source: own work

from the subjective perspective of experts. Table 2 indicates that a total of 167 TMA could be identified at Harz University of Applied Sciences in the 2018/19 winter semester and 2019 summer semester by interviewing 57 university members.

By encoding and grouping the statements in the interviews, a systematic overview about the characteristics of the TMA at the participating university of applied sciences could be obtained. This includes besides others the target structure illustrating the respective mission of the TMA as well as statements entailing information on the consumption of resources and information about the format or design of those activities towards or together with the non-academic environment.

In order to gain further and more detailed insights a second wave of interviews was executed for a smaller sub-sample of 29 TMA. Here, the focus was especially on the consumed resources that could be split into the sub-sub-categories “equipment”, “paid staff”, “students”, “rooms” and “financial budget”. The fact that those 29 activities have already been completed in 2021 and 2022 enables the interview partners to estimate and/or calculate the respective consumed inputs more exactly. Moreover, the outputs, outcomes and impacts of those TMA after about 2 years of activity were collected and will be analyzed in a forthcoming investigation (see Westermann & Schubert, 2023).

Table 3 shows the two waves of the interviews together with the main information derived for the investigation presented in this paper before the results of this case study are given in the following paragraph.

4 Results: A Structured TMA Portfolio of a German University of Applied Services

The following section contains the most important results of the two surveys if the suggested definition-led approach is applied. It has to be stated that the results of this case study are in no respect representative for the TMA of other HEI. The reason to conduct this empirical study was to test the basic ability of the approach to structure the various and heterogenous TMA in a way that enables their goal-oriented management.

In order to get an idea of the scope and structure of the third mission activities at a university and to test the evaluation methodology developed, a full survey of all third mission activities of the 2018/19 winter semester and 2019 summer semester was carried out at the Harz University of Applied Sciences. In this qualitative case study, personal interviews were conducted with all 57 university members who could be identified to have carried out third mission activities according to the definition above.

4.1 Starting with Two Dimensions for an Overview

In Fig. 3 the results of the interviews are structured in a portfolio based simply on the two dimensions "aims" and "outputs". The third possible dimension ("inputs") was skipped in order to start with an overview on the TMA carried out at this

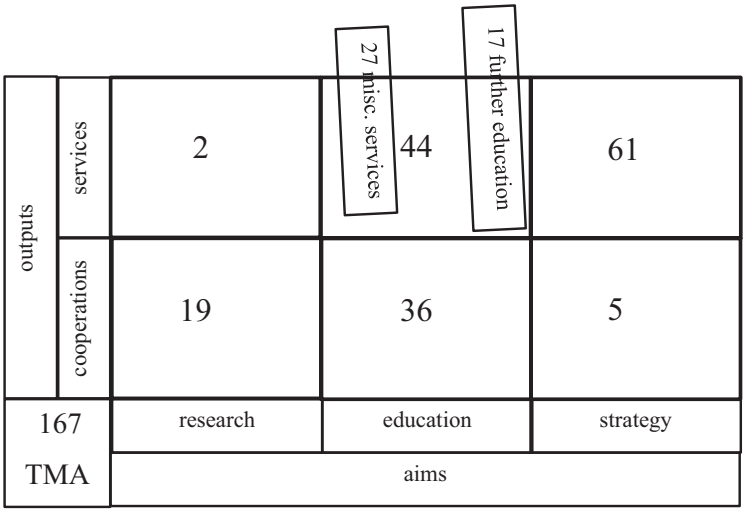


Fig. 3 Two-dimensional third mission portfolio of the Harz University of Applied Sciences. Source: own illustration

specific HEI and to dig deeper into the two remaining dimensions. Thus, for the "outputs" dimension, it was even possible to make a finer division into the types of services provided (i.e., miscellaneous services, publications, presentations, further education). In the next paragraphs the "inputs" dimension is going to be added again.

The graphical representation in Fig. 3 demonstrates that the TMA portfolio of Harz University of Applied Sciences consists of 167 activities altogether of which certain fractions can be labelled as "research oriented" (2 + 19 = 21), "education oriented" (80) and "strategy oriented" (66). It is also evident that 107 TMA provide services towards the non-academic environment while 60 show the character of cooperative projects with external partners. The biggest clusters in the sense of aims-output-combinations measured by numbers of TMA are "strategy oriented" services" (61), "education oriented" services (44) and "education oriented" cooperations" (36). As universities of applied sciences in Germany focus traditionally on the education mission the result is no surprise. For the management of a HEI this information provides the possibility of squaring the observed TMA structure with the respective strategic goals of the institution and to act or counteract if necessary.

Having a closer look at the formats in which the 44 "education-oriented services" are provided to the surrounding society of Harz University of Applied Sciences it becomes evident that the most prominent cluster is the group of "miscellaneous services" (27 out of 44 "education-oriented services"). These services are mainly delivered to the non-academic environment via so called "service-learning projects". Here, students tackle limited practical problems of local companies or public institutions that become part of regular project seminars at the university.

The remaining TMA of this cluster can be subsumed under the label of "further education" activities provided to the society. Both findings seem to be typical results for a German university of applied services with a focus on solving practical problems. Nevertheless, the small number of research-oriented TMA might cause the HEI leaders to reinforce the motivation of researchers to provide research activities to solve practical problems with or for the external environment. Additionally, fixing the weakness in creating TMA with a focus on strategic cooperations might be another pivotal element for future management actions.

4.2 Adding the Third Dimension to the Portfolio

In a next step the two-dimensional portfolio of Sect. 4.1 shall now be expanded by integrating the dimension of the resources consumed by the respective TMA. In order to provide a graphical representation a treelike structure is introduced here. As mentioned before this implicates a kind of a "path dependency" with respect to the order in which the three dimensions appear in the portfolio. It must be emphasized here that the choice of the sequence of dimensions should be a consequence of the information that is to be gained.

Figure 4 demonstrates this by starting with the two dimensions "aims" followed by "outputs" already provided in Fig. 3. One example for additional information to

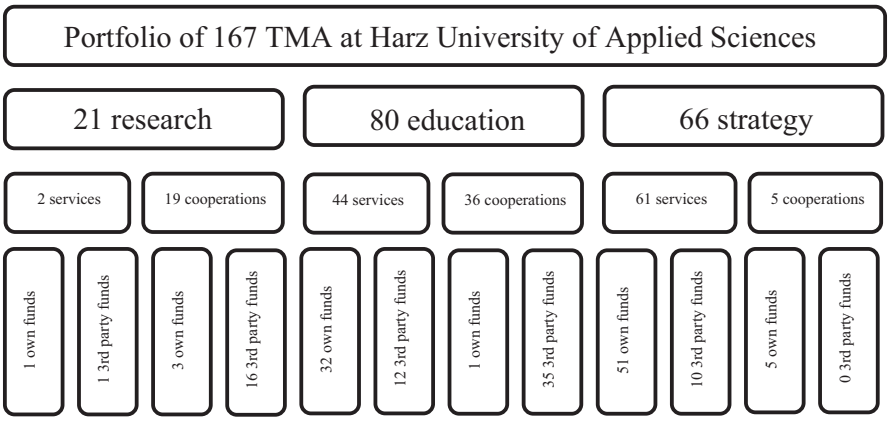


Fig. 4 Three-dimensional third mission portfolio (sequence: aims—output—input). Source: own illustration

be gained by introducing the third dimension of "inputs" here is that 16 out of 19 cooperative research-oriented TMA are third-party funded. This heavy interest of external parties willing to pay for cooperation with an academic institution hints on a strong potential for an increase in research cooperations that might lead to a mitigation of the low number of strategic cooperations mentioned above.

Changing the order of the dimensions from "aims-outputs-inputs" to "aims-inputs-outputs" as it is done in Fig. 5 can provide the additional information that a huge proportion of the "education-oriented" TMA are financed by the HEI itself (67 of 80 TMA). This even applies for the majority of educational services of TMA where only 12 earn at least partly funds from external sources while 32 services consume mainly HEI resources. Here HEI leaders could discuss the possibilities to involve more external budgets in the provision of those services. Especially the 6 part time study programs might quickly offer the respective opportunities while 26 service-learning projects could be used for demonstrating the strong links of the HEI into the region via public relation measures.

Another example for a change in perspective shall be demonstrated in Fig. 6. Here the sequence starts with the distinction in domestic funding and external funding (inputs) before it sheds some light on the respective aims and outputs. Following this path to the biggest cluster leads to a group of 51 TMA that are devoted to "strategy-oriented" services towards the society.

Besides 18 popular scientific presentations and 4 popular scientific publications 28 miscellaneous services demonstrate that the HEI spends own funds for being connected to the surrounding society. A closer look into those TMA shows a broad spectrum reaching from cultural activities (e.g., art exhibitions, music events) to offers of support for daily life problems (e.g., repair café).

In order to gain additional insights into the structure of resources or inputs consumed by the respective activities a sub-sample of 29 TMA were deeper investigated in a second wave of interviews after they were accomplished in the years 2021

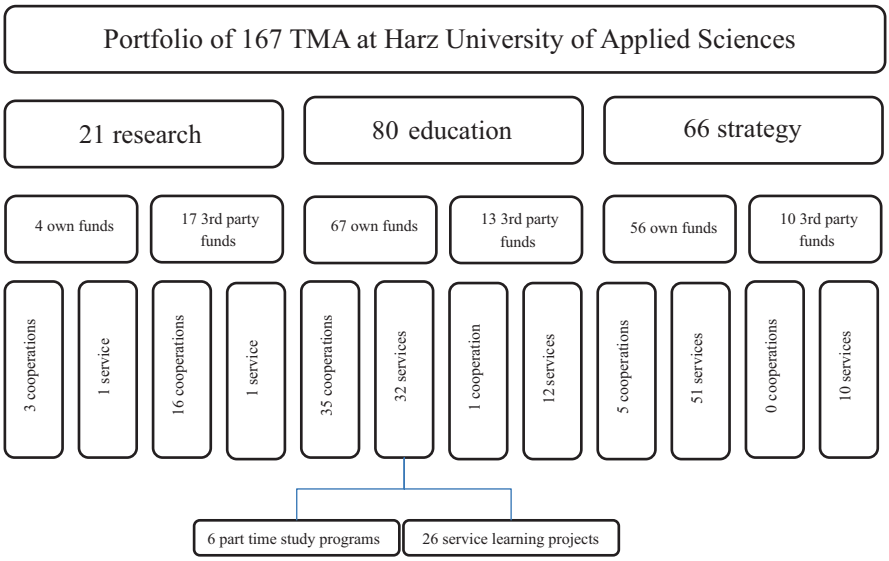


Fig. 5 Three-dimensional third mission portfolio (sequence: aims—input—output). Source: own illustration

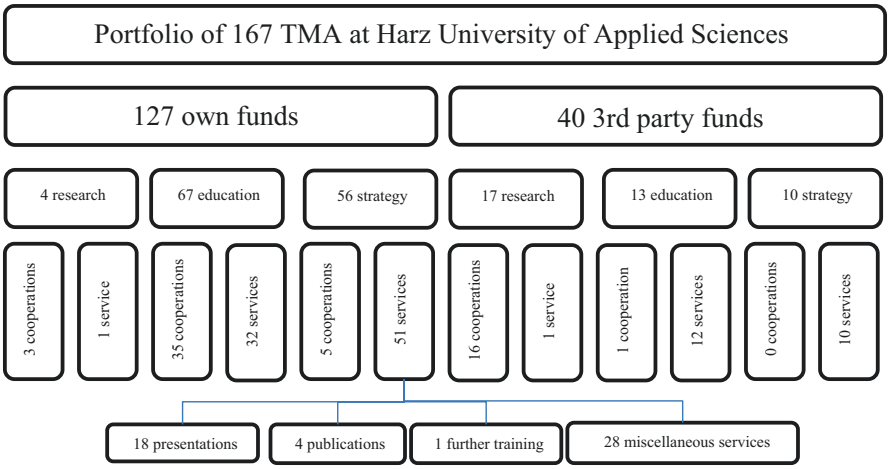


Fig. 6 Three-dimensional third mission portfolio (sequence: input—aims—output). Source: own illustration

and 2022. Table 4 gives a rough overview on the consumed resources and the underlying funding structure.

On a first glance it seems remarkable that students are the most intensive used input of the HEI under consideration. The explanation might be that the resource "students" is defined as students who work for a TMA because of curricular reasons

Table 4 Inputs and Sources of the TMA

Input funded by …	Equipment	Paid Staff	Students	Rooms	Money
Mixed funds	8	9	0	4	5
Own funds	16	17	23	20	6
3rd party funds	1	2	2	3	12
Input not consumed	4	1	4	2	6

Source: own work

Table 5 Cost Structure of an average TMA (without students)

Equipment	Fin. expenditures	Staff	Rooms	Total
1.039 €	*639 €*	*9.763 €*	*779 €*	*12.220 €*
9%	5%	80%	6%	100%

Source: own work

or voluntarily. That means that this input does not require the scarce monetary resources of the HEI. Another finding points to the fact that for almost all kinds of inputs (4 out of 5) the vast majority of the TMA needs the funding (completely or at least partly) by HEI budgets. The fact that third parties seem to be more willing to contribute money to TMA than other resources might bare a chance for external funding approaches.

With respect to the cost structure of the resources consumed by the 29 TMA investigated in the second wave of interviews it becomes evident that "staff" is by far the most important factor. Table 5 demonstrates that for an average TMA 80% of the input costs originate from human resources. This result seems to be no surprise as in recent research it could be shown that TMA have very similar properties compared with complex and knowledge-based services (see Westermann et al., 2022).

As explained before usually no monetary resources of a HEI are required when students work for a TMA within regular courses in the curriculum of their study programs. Therefore, this might not be considered as cost from a simple profit-oriented point of view of the HEI management. On the other hand, the labor time of students is also a scarce resource that could be used for other tasks within or outside an academic institution and should be at least priced with the average minimum salary of a student working for the HEI. Considering those opportunity costs in Table 6 demonstrates that "students" is the most important input for the investigated TMA when added to the calculation. Moreover, together with the costs of other HEI members it becomes evident that the costs for human resources add up to 90% of the total costs of an average TMA in the sample.

HEI leaders should become aware of the importance of staff and student costs for the provision of TMA in their institutions. If the strategy of a HEI includes approaches of intensifying cooperations with external partners this does not come at zero costs. Staff members of the HEI should then be granted a certain fraction of their labor time for this purpose. Moreover, if "students" are the most important resource for the TMA provision this must be accounted for in the respective curricula of the programs if they do not get paid for it.

Table 6 Cost Structure of the TMA (including students)

Equipment	Fin. expenditures	Staff	Students	Rooms	Total
1.039 €	*639 €*	*9.763 €*	*12.240 €*	*779 €*	*24.266 €*
4%	3%	40%	50%	3%	100%

Source: own work

The perceived empirical results of this case study hold only for the specific HEI under consideration and for the period the data were collected. Nevertheless, they should be compared to other studies in order to check if they comply with up-to-date research in this field. Especially Thomsen and Püttmann (2022, p. 1) confirm the heterogeneity of TMA measured in this study by stating "… that the third mission is firmly included in the academic identities … and that the forms of inclusion differ." They find that the aims of TMA and therefore the respective goals differ strongly within academic disciplines and personalities of the persons providing the activities. Nguyen et al. (2021) emphasize in their findings that there exist groups of TMA varying in their influence on the performance of an HEI and differing in their respective extent of academic engagement, academic commercialization and public engagement. Even if they create different (and only one-dimensional) clusters of TMA, it seems evident that a portfolio considering the various dimensions of those activities is helpful for management decisions of academic institutions. Concerning the definition of TMA and its three dimensions Berghaeuser and Hoelscher (2020) analyse the mission statements of public universities in Germany finding that civic engagement and further education are broadly underrepresented in those documents. These findings are in a contrast to the empirical results of the case study in this investigation where especially the education-oriented services towards the society form huge clusters within the TMA portfolio.

As a concluding remark concerning the comparison with other empirical findings it might be said that the dimensions of a portfolio might differ between institutions and stakeholders because of their respective individual aims and goals. Nevertheless, it seems apparent that it is necessary to integrate the heterogeneity of TMA into the management of HEI by applying adequate and multidimensional tools.

5 Summary and Implications of the Results

It could be shown that even if TMA are usually diverse with respect to their content, often individually motivated and therefore very heterogenous there are possibilities to account for them systematically. Moreover, an approach to structure the respective portfolio of a HEI with the help of three-dimensions derived from the definition of TMA was suggested, further elaborated and (in Sect. 4.2) compared to other empirical approaches.

A case study for a German university of applied sciences based on this framework has been carried out in order to investigate the applicability of the proposed

TMA classification. It could be demonstrated that this approach is able to structure the variety of 167 TMA detected at a HEI during 2019/20 with respect to the potential perspectives of HEI leaders upon those activities. Applying the proposed tool, it would be possible to start controlling TMA like other HEI missions (i.e., education and research). Additionally, a structured portfolio of these services to the society could be the starting point to evaluate and compare the TMA of a HEI with the help of adequate management instruments in order to increase both their effectivity and efficiency. The study of Nguyen et al. (2021) emphasizes that this can significantly enhance the performance of an academic institution.

In order to apply the suggested approach to the management of TMA it became evident that there is still a lack in the structured collection of information about these activities and their respective goals on the level of institutions. Therefore, it seems necessary to agree on an adequate and individual set of indicators for the TMA of a HEI—comparable to those applied for the other two missions. Especially the strategic goals of TMA should be integrated into the mission statements of academic institutions.

Even if the findings of this investigation seem to confirm the assumption that it is possible to develop and apply management tools to TMA this is still a first attempt in structuring these activities with the help of a portfolio approach. What has been left out, so far, is the evaluation targeting the efficiency or effectivity of TMA. Especially the above demonstrated heterogeneity of those activities originating from the various stakeholders and their respective different goal systems lead to difficulties in the evaluation. Therefore, for future research it will be necessary to find and apply evaluation tools that are able to handle the heterogenous goal systems of different stakeholder groups or individuals. Multi Criteria Decision Making Methods (see for an overview Aruldoss et al., 2013) might offer solutions to these challenges. As an example for this direction of research, Westermann and Schubert (2023) apply an adapted Value Analysis approach to evaluate TMA.

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Exploring Success Factors Underpinning the Delivery of UN SDG-4 Quality Education Projects in Pakistan



Sidra Shahid, Martyn Polkinghorne, and Milena Bobeva

Abstract The global population is rapidly growing, exerting pressure on limited resources and necessitating the prioritization of sustainability. In this context, the United Nations has set 17 Sustainable Development Goals (SDGs) to be achieved by 2030, with quality education (SDG-4) playing a crucial role in empowering individuals and fostering economic growth. Pakistan, with its young and expanding population, faces significant challenges in its educational system, including high dropout rates and gender disparities. Non-Governmental Organizations (NGOs) have played a pivotal role in the development of Pakistan's education sector, receiving substantial investments from various donors. However, the success of educational projects delivered by NGOs requires effective monitoring and evaluation. This research adopts a case study approach, conducting qualitative interviews with 25 key stakeholders, including NGOs, donors, and government representatives. The study reveals key factors essential for project success, resulting in the development of new understanding which emphasizes the need for projects to be aligned with the project lifecycle. Furthermore, it highlights the importance of addressing genuine community needs, and ensuring community readiness to benefit from educational initiatives. Data collected indicates that a failure to consider these factors can impede project progress. With this new understanding, NGOs and stakeholders can enhance the success of educational projects in Pakistan, aligning with SDG-4 objectives and contributing to inclusive and quality education for all. This research not only provides insights specific to Pakistan, but also offers valuable lessons for educational projects delivered by NGOs globally.

Keywords Sustainability · Sustainable development goals · Project management · United nations · Project success · Project stakeholders · Framework

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1 Introduction

The global population has been steadily increasing (Ezeh et al., 2012), placing significant pressure on the planet's limited resources. According to data compiled by the United Nations Population Fund (United Nations Department of Economic and Social Affairs, 2022), the global population is expected to reach 7.6 billion by the late 2020s, more than double its 1960s level of 3 billion. The current rate of population growth adds approximately 80 million people per year, resulting in over 1 billion additional individuals on the planet every decade. This rapid expansion of the human population raises concerns about sustainability and our efficient use of natural resources (Ramankutty et al., 2002).

Sustaining the present pace of population increase necessitates substantial utilization of natural resources for sustenance, housing, healthcare, consumer spending, and economic expansion (Hales et al., 2007). However, the availability of these resources, such as oil, coal, and natural gas, is limited and non-renewable (George et al., 2018). The scarcity of these resources poses a barrier that may impede economic growth. Therefore, it is crucial to find solutions that enable economic growth to occur whilst ensuring sustainability and minimizing environmental degradation (Stiglitz, 1974).

In line with the need for sustainability, the United Nations introduced the Sustainable Development Goals (SDGs) in 2015, encompassing 17 global goals to be achieved by 2030 (Biermann et al., 2017). These goals address issues such as poverty, health, education, inequality, climate change, and economic disparities (Costanza et al., 2016). SDG-4 specifically focuses on Quality Education (Polkinghorne & Bobeva, 2022), with seven sub-objectives and eight performance indicators. These goals build upon the previous Millennium Development Goals (MDGs) established in 2000 (Fehling et al., 2013).

This paper aims to explore the importance of educational projects in Pakistan, the fifth-most populated nation in the world (United Nations Population Fund, 2022), with a particular emphasis on the role of Non-Governmental Organizations (NGOs). The research builds upon previous work by Shah (2018), Bruns et al. (2019) and Diemer et al. (2020) who have considered the implications of delivering educational projects in Pakistan, and creating linkages to the UN SDGs.

Pakistan faces significant challenges in its educational system (Memon, 2007), including high dropout rates, gender disparities, and a shortage of high-quality learning opportunities (Murtaza & Hui, 2021). Educational reforms have been implemented (Riaz et al., 2017; Durrani & Halai, 2018), and NGOs have played a vital role in supporting the government's efforts by delivering educational projects (Batley & Rose, 2010; Bano, 2008). Monitoring the success of these projects becomes crucial to ensure their effectiveness, and in particular their sustainability.

This research adopts a case study approach to investigate the factors that NGOs must consider when monitoring the progress and success of their educational projects. Semi-structured interviews were conducted with key stakeholders, including project participants, government representatives, and donors. The qualitative data

collected is analyzed using a recursive abstraction process to identify patterns and trends. The findings contribute to the development of an evaluative tool that can guide NGOs in monitoring the success of educational projects in Pakistan, and potentially in other contexts as well.

Overall, the successful implementation of educational projects in Pakistan is essential to tap into a pool of skilled individuals, increase productivity, and improve the country's economy. By addressing the challenges faced by the educational system, Pakistan can strive towards achieving the SDGs and ensuring a better future for its population.

2 Sustainability

Sustainability in the context of this paper shares historical roots with the industrial revolution in the seventeenth century (El-Haggar, 2016). The industrial revolution resulted in an overall increase in population, economic growth, automated processes, technological advancements, and the long-term growth of business organizations. The increased population, along with the industrial boom, exploited the available natural resources. Natural resources, for the most part, constitute exhaustible and non-renewable resources, including oil, coal and natural gas. The limited availability of these natural resources in today's world puts in place a barrier that will stifle economic growth (Michael Henke, 2021). The manufacturing of products and services, through different stages of economic development, generates both wealth and jobs. Such growth both affects, and is affect by, the sustainability of a country's economy (Ashworth, 2017). It is therefore important that we find solutions that enable economic growth to occur, whilst simultaneously ensuring that the activities necessary to drive and support such growth are sustainable.

2.1 United Nations Sustainable Development Goals

The United Nations (UN) is an organization that is comprised of 192 different countries from all over the world. The upkeep of international peace and security is one of the many tasks that the United Nations undertakes. In 2015, the United Nations unveiled its agenda for sustainable development with a series of 17 sustainability development goals (SDGs) that need to be delivered by the year 2030. These sustainability development goals are also known as global goals. The global goals recognize the need to prioritize issues such as poverty, health, education, inequality, climate change, and economic inequalities. Furthermore, the goals have been broken down into 231 individual performance indicators. SDG-4 relates to quality education, and this specific goal has seven sub-objectives, with the individual objectives being further divided into a series of eight performance indicators (General Assembly, 2017).

Formally established in the year 2000, there were originally eight Millennium Development Goals (MDGs) that were used to serve as the foundation upon which the current global goals have been constructed (MDG Gap Task Force, 2015). The Millennium Development Goals (MDGs) sought to end extreme poverty and hunger, improve access to healthcare, reduce the prevalence of infectious illnesses like HIV/AIDS, expand educational opportunities, and raise public awareness about the importance of good hygiene practices. The global Sustainable Development Goals replaced the MDGs, with the overarching objective being to "leave no one behind" (Ministry of Planning, Development and Reform, 2018a).

3 The Need for Educational Projects in Pakistan

Pakistan ranks as the world's fifth-most populated nation, with a total of almost 221 million inhabitants (Worldometer, 2022). A case study from the United Nations Development Programme from 2018 indicated that 64% of Pakistan's total population was under the age of 30 years old at that time (Ahmad, 2018). This statistic continues to grow, and represents the largest share of the population that has ever been under 30 simultaneously in Pakistan. By some estimates, by the end of this century, the population of Karachi alone might exceed 32 million (Department of Economic and Social Affairs, 2019) which would be a single city in Pakistan being larger than many individual western countries.

Pakistan needs to invest in its young people so that it can tap into a pool of skilled employees. The country needs this skilled labor force so that it can increase productivity levels and so boost the nation's economy, and consequently this will improve the quality of life for its whole population (Rivkin & Schiman, 2015). If this cannot be achieved, then unemployment, and social unrest, are two of the negative outcomes that may result from a population of people who did not finish their schooling, and so have reduced life chances and opportunities. A study from 2021 indicates that Pakistan has the world's highest incidences of school dropouts (Ali et al., 2021). Current estimates suggest that 28% of students are either not attending school or have dropped out. It is also projected that children between the ages of 5 and 16 years account for 22.8% of school dropouts, with the bulk of chronic truants falling in the 5–9-year-old age range, and often being located in the more rural areas (Pakistan Bureau of Statistics, 2021). In light of these statistics, the government in Pakistan has introduced educational reforms to increase the rate of literacy in the nation.

Since it first gained its independence, Pakistan has been struggling with a number of political and economic issues, all of which have served to compound the country's pre-existing problems of poverty and social inequality. As a consequence of having the lowest literacy rate throughout the whole of the South Asian continent, Pakistan is less able to adapt to changing global conditions and opportunities (Amir et al., 2020). Without taking action, the country faces the prospect of being left behind in terms of economic development (Bureau of Statistics, 2019).

Since the beginning of the twentieth century, Pakistan's educational system has been plagued by a shortage of high-quality opportunities for learning. The low academic performance of students in elementary schools, and the high proportion of students who drop out of school subsequently, have proven to be especially challenging issues for the Pakistani education system (Ahmad et al., 2013). Furthermore, there are more out-of-school females in Pakistan, than there are out-of-school males, that is magnifying the existing gender divide.

The Pakistani government has consequently invested heavily in its educational system, especially during the last decade when it received funding from a variety of foreign donor organizations to improve the country's educational facilities. A wide range of educational programs have been developed in recent years with the goal of improving the overall standard of education. To facilitate this process, there are also a variety of NGOs in Pakistan that run education programs to raise standards, increase opportunities, and address barriers to inclusion. Examples of such programs include the Early Childhood Development (ECD) Program, which is run by the Pakistani government, the Teachers Training Program (TTP), which is run by USAID; and the Investing in Pakistan's Young People, which is run by UNICEF.

For all of these reasons, both national and global, it is important that educational projects being delivered in Pakistan succeed (Pakistan Ministry of Planning, Development & Reform, 2018b), and this success requires continuous monitoring against agreed criteria. In the context of projects being delivered by NGOs, this monitoring needs to consider their multi-stakeholder position, and with respect to quality education projects, it needs to consider the level of sustainability being achieved so that individuals are provided with the knowledge and skills necessary to improve their life choices, and their impact upon others.

3.1 The Role of Non-Governmental Organizations

NGOs have played a crucial role in the political development of Pakistan since the country's independence in 1947. Rehabilitating affected communities, and ensuring that they have access to essential services, has been the primary focus of the crucial work undertaken by these organizations. Whilst NGOs have particularly been involved in the development of the education sector, they have also been instrumental in supporting the government to establish a foothold in both poor and rural areas, with a particular emphasis on the provision of fundamental amenities, e.g., improvements in health and sanitation, poverty eradication, and educational uplift. As a direct consequence of this, a number of NGOs in the country now exist with the specific mission of defend human rights and aiding those who are disadvantaged and oppressed.

The Pakistani Foreign, Commonwealth, and Development Office (FCDO), has released research data estimating that in total 52 donor organizations invested over $4.1 billion in Pakistan in the period 2021 to 2022. Financial institutions, international organizations, and private donors are all represented by NGOs. In fact, from

all of the NGO related investment, approximately 34% goes towards education, and 25% goes toward alleviating poverty, with the rest being split between improving people's diet and health, increasing power production and availability, and promoting more democratic and fair societies (International Development Committee, 2022). Despite the government of Pakistan's best efforts, there are still issues inside the country's educational system that it cannot resolve without external support. A number of fundamental obstacles, such as the country's unregulated population expansion, the general public's attitude toward education, ongoing high levels of unemployment, and a shortage of financing, have all impeded the government's performance in boosting the country's education standards. With this in mind, NGOs have taken direct action, and are talking to communities about the importance of education, and the positive impact it can have on their community.

Considering the global goals, NGOs play an essential role in delivering key projects, especially education projects. In fact, the financial contribution that NGOs have made to promote sustainable quality education across the country vastly exceeds the contribution that the government of Pakistan has made on its own. In view of this, the need to monitor the success of the quality education projects being delivered by NGOs becomes even more important to ensure their timely completion and that there is an appropriate return on investment.

4 Research Design

This research has considered NGOs that deliver quality education related projects in Pakistan. The participating NGOs include international organizations and locally based ones within Pakistan. Data has also been collected from other related stakeholders including the government of Pakistan, and donors who fund the NGOs to deliver projects. All participants are experienced at working on multiple projects over several years. In each case, participants involved are connected with project delivery, and they have shared their thoughts and views regarding how best to monitor the success of educational projects in terms of sustainability, and also in the context of needing to satisfy stakeholders. No community stakeholders were considered as their experience would be limited to only a single project.

This is an interpretivist study using an inductive approach and a cross-sectional time horizon (Saunders et al., 2019). The data collection strategy is based upon semi-structured in-person interviews (Collis & Hussey, 2021). Participation in this study was on a voluntary basis, and the qualitative data collected has been analysed using the recursive abstraction process (Polkinghorne & Arnold, 2014; Polkinghorne & Taylor, 2019). Recursive abstraction is a process for identifying patterns and trends within data through the creation of themes and codes (Polkinghorne & Taylor, 2021). Anonymized data collected has been stored on secure servers. The study undertaken has complied with Bournemouth University's ethical guidelines (Reference 39,494). Each interview was approximately 1 h in duration and all interviews were held during 2021. Participants interviewed were identified using a

purposive sampling method to ensure that specific people, with the right range of experience, were included in the study (Bell et al., 2018). In total 25 participants were interviewed as detailed in Table 1.

Interview questions were designed to reveal the key factors necessary to ensure project success. Interviews were recorded with the participant's permission to ensure that data analysis was based upon accurate transcripts. This has also enabled quotes to subsequently be extracted from the transcripts to illustrates the findings. The findings of this study are based upon the personal 'lived experiences' of those being interviewed and so the data collected is rich and informative. As such, the views and opinions gathered do not necessarily represent any official government or NGO view, but instead are those of real practitioners working in the field.

5 Findings

Following the application of the recursive abstraction data analysis process, the findings derived from this research that emerged can be divided into the four clearly defined themes as detailed below:

5.1 Theme 1: Key Success Factors for Initiating Educational Projects

Sometimes, particularly when promoted by external stakeholders to satisfy their own agendas, the perceived need for a project may differ from the actual need. To justify a project, effort is required to establish if there actually is a community need for this project, and for the proposed deliverables, and then this need must be clearly defined and agreed from the start. This definition is the foundation for the whole project.

Table 1 Categories of participants interviewed

Category of participants interviewed	**Number of participants interviewed per category**
Chief executive officers	5
Senior managers	5
Middle managers	5
Team leads / field staff	5
Government officials / academics	5
Total	**25**

Source: Authors' Own Work

> *The need identification is the most crucial [project] stage because if the need hasn't been identified properly, then there are few chances for that project to … achieve success* (Participant 1 – Organization A).

Once the community need has been defined to the satisfaction of all parties, there is an opportunity to reflect upon the NGO that is going to be asked to deliver the project. Does this project fall within their mandate or is it beyond their area of experience. Conflicts in such situations may include the geographical location of the project, the nature of the deliverables planned, and/or the resources (both human and financial) required to achieve a successful project.

> We must examine [the geographic and demographic] issues in the targeted community (Participant 11 – Organization K).

Equally, the donor will have their own priorities and agenda. Does the defined project still fit comfortably within them, or has this proposed new project taken an unexpected direction. Donors who are funding projects outside of their normal priority areas may be less willing to offer support, and in some case may unexpectedly decide to redirect their funding to another project considered to be more appropriate.

> *There is also a need for donors to consider the needs of the community. They must not expect unrealistic or unattainable results* (Participant 4 – Organization D).

Irrespective of what the various stakeholders are trying to achieve for themselves from the project, it is unrealistic to think their ambitions will always be fully aligned, so there still needs to be a shared vision for what the project is trying to achieve. It is this shared vision that ties the partnership together and ensures that everyone is working towards the same aims and deliverables, irrespective of their rationale for doing so.

> *To analyze needs, we must understand that a need is a challenge that the community faces* (Participant 11 – Organization K).

5.2 Theme 2: Designing Educational Projects

The community due to benefit from the project must be involved in project design. It is only through this close involvement that the donor and the NGO can be confident that the project can be delivered, and that the deliverables once achieved are going to be 'fit for purpose'. This close involvement resembles the process of 'action research' (Saunders et al., 2019) and helps to embed project outputs and outcomes within the community.

> *Need identification is the most crucial stage. If the need hasn't been identified properly, then the project is unlikely to succeed* (Participant 20 – Organization A).

Whilst the donor promises the required funding for the project, in reality they are most likely to release different elements of the funding in installments as the project progresses, and they may wish to do this at the last possible moment for their own

cash flow reasons. If the donor is waiting until the funding is actually required by the project before releasing the money, then they need to transfer the funds promptly as otherwise the project may be placed on hold for the interim period of time, and such delays can have incremental knock-on effects on subsequent project activities.

> *Sometimes the donors take more than the specified time to decide upon the funds' release, the delay of which causes the project to be irrelevant or outdated* (Participant 12 – Organization L).

Similarly, on many occasions, the Pakistani government will have to issue a *no objection certificate* before work on a project can commence. Until this is done, the project is left in a limbo in which the need for the project has been established, the funding for the project is in place, and in some case the resources required have been sourced, and yet the actual work of delivering the project cannot begin. Delays at this stage can prove to be expensive in terms of both finances and time. In some cases, delays in receiving the *no objection certificate* may actually make the rest of the project undeliverable as situations can change, and opportunities can be lost. It such circumstances it is unlikely that the community need will change, but various unexpected political, social, environmental and fiscal changes may occur without warning.

> *Time frame is very important in this aspect. Because the projects are time-bound, even a slight delay can either cause over-expenditure or sometimes unfulfilled goals* (Participant 12 – Organization L).

Resources have to be identified to support project delivery. In this context, resources will include labor, equipment, logistics and time. Consideration has to be given to ensure that enough resources are available, and at the right point in the project. In reality, project delivery can be variable, and therefore resource need is often planned ahead based upon estimates. Where funding it limited, there is often a temptation to utilize lower quality resources, but this is a factor that can subsequently have a serious impact upon the resulting satisfaction of the benefitting community.

> *The project is sometimes over-resourced, [but] sometimes it is under-resourced which also contributes to the failure of the project* (Participant 20 – Organization A).

A logical (Log) framework is a project planning tool that lists activities in sequence. The purpose is to enable project managers and stakeholders to agree the order and timing of activities. In an environment in which project management tools are not often used at all, it is the minimum requirement that a Log framework is developed and agreed by stakeholders, and it is essential that such a document encompasses as many dimensions of the project as possible to ensure that it is comprehensive. The value of the Log framework is directly related to two factors, these being:

1. the care and attention spent on creating it;
2. the relevant experience of those involved in the creation process.

I also believe that delivering successful projects is teamwork, if we incorporate the right project management practices along with the proper community research … then we can at least expect our projects to be effective (Participant 1 – Organization A).

5.3 Theme 3: Implementing Educational Projects

How the NGO is performing is important, but it is not something that they themselves are in a position to assess. The best positioned person/organization to consider the NGO's performance is actually the donor since it is their money which is being spent on the project, and therefore they need to be content that the money is being directed to the right places, and that the NGO is operating with integrity. The donor must therefore undertake external monitoring of the NGO's performance, and this should be a continual process to avoid problems later in the project.

There is external monitoring which is carried out by the donors which evaluate[s] the performance of the project (Participant 2 – Organization B).

Sometimes, quite often in fact, communities are excited to receive the help and support of the project. The community has so many needs and desires, and they see the project as being a solution to many of them. In reality, the project has a defined scope, and the donor has only agreed to fund certain activities and so may not be comfortable with funding other activities. The NGO therefore needs to manage the expectations of the benefitting community both in terms of what the project will deliver, and when the project will deliver it.

Donors sometimes allow us to redesign the project, and sometimes they do not allow us to redesign the project, so it varies on terms and conditions provided by the Donors (Participant 4 – Organization D).

Because the NGO is working with the community in this way, it becomes difficult for them to remain objective in terms of collecting feedback from the community. There could be pressure placed upon the NGO to expand the project scope in return for good feedback. Such an arrangement would be unfair and unethical. To maintain objectivity, the donor is therefore best placed to liaise with the benefitting community to gather their feedback, and such feedback needs to relate not just to project deliverables, but also to the process of delivering the project, and with regard to any decisions that have been taken during the course of the project.

5.4 Theme 4: Evaluating Educational Projects

At the end of a project, participants identified the importance of the project deliverables being fulfilled completely, and in accordance with the project's aims. Partial fulfilment, due to financial, logistical and/or time constraints, may cause problems that undermine the value of the whole project.

> *We conduct the mid-term evaluation to ensure the feasibility, performance, and overall target achievement … also, we regularly monitor our activities such as budget allocation, program activities, work plan evaluation, and [have] regular meetups with the staff* (Participant 2 – Organization B).

To this aim, it is essential that a dialog is undertaken with the target community to determine their level of satisfaction. Has the project delivered what the community expected, and is what they received actually 'fit for purpose'? Often other factors emerge that can limit the success of the project's deliverables, even though the deliverables themselves have been implemented as expected. This satisfaction needs to be assessed in the context of agreed indicators to prevent the occurrence of project creep.

> *the estimate of activities planned [versus] the actual result obtained through conducting various activities … [helps] us calculate the overall performance of our projects* (Participant 2 – Organization B).

Equally, the satisfaction of the donor must be considered. The donor has funded the project in the expectation of achieving something important. Has this been achieved, and is the donor satisfied? Once again, this satisfaction needs to be assessed in the context of agreed indicators, and the NGO needs to be aware that without spending more money, donors sometimes demand more outputs and outcomes that are beyond the scope of the agreed project.

> *We also meet our stakeholders and [obtain] their feedback on the project which also allows us to measure our performance. Satisfied stakeholders mean the project attained its target and vice versa* (Participant 3 – Organization C).

Quality education projects need to support the aspirations of the global goals, and especially those of UN SDG-4. A project's level of sustainability must be compared to agreed indicators, and these indicators must link through to SDG-4 targets, and will often relate to educational inclusion, equity and opportunity. However, they may also link to more holistic dimensions such as the ability of the community to become more self-sufficient, and consequently less reliant upon the state.

> *Any deviation from the set targets and indicators is a clear indication that the project is derailed, and the desired results cannot be obtained* (Participant 3 – Organization C).

At the end of the project, it is essential that the ownership of all deliverables is transferred to the benefiting community. This is not just about the community having the benefits, but this is also about the community having the knowledge, permissions, and resources to use, manage and manipulate the project deliverables to ensure that they remain appropriate and functional over time. This is a key element of sustainability that must not be overlooked.

> *An NGO has to ensure that not only beneficiaries [are] benefitted, but also, the donors get satisfied too. For this purpose, post-project surveys and interviews prove to be very helpful in seeking the community's reaction [to] a project* (Participant 11 – Organization K).

Finally, once all other actions have been completed, the project needs to be reviewed by the stakeholders so that any lessons that can be learnt, are understood,

and documented. Lesson logs of this nature are commonplace in western countries with a long tradition of using project management processes but are far less common in many Asian countries in which formalized project management remains a relatively new concept. Lessons captured can include both good and bad practice. When future projects are initialized and then designed, these lessons become essential for building upon good practice, and for avoiding previous problems and issues.

5.5 Summary of Findings

Consolidating the above findings, it has been possible to identify the key dimensions for an evaluation tool (Table 2) that NGOs and other stakeholders can use to drive the success of their educational projects.

The tool follows the project cycle and interestingly, projects that don't consider the key success factors when initiating projects, and during in the design phase, may not be able to recover during the implementation phase. Key to this is ensuring the project being designed and delivered meets a genuine community need, and that the community will be in a position to exploit the benefits of the educational project at the end. An example of when this has not occurred, is the case of a school being provided with an amazing array of educational technology to improve the learning experience of students, even though the remote location didn't have the reliable electricity necessary to be able to power and use the equipment, which meant that although the project had satisfied its aims of installing the equipment, the community was no better off as a result.

6 Discussion

The findings presented in this paper shed light on key success factors for initiating, designing, implementing, and evaluating educational projects being delivered in Pakistan to ensure that they align to the aspirations of SDG-4 Quality Education. The following discussion will focus upon the themes that emerged from the participants' perspectives, highlighting their implications and providing insights into effective project management in the context of education initiatives.

The first theme relates to key success factors for initiating educational projects, and it focusses upon the critical importance of accurately identifying the community need before initiating an educational project. Participants stressed that aligning the perceived need with the actual need is crucial to project success. They highlighted the need for a comprehensive definition of the community need, which should be agreed upon from the project's inception. This shared understanding of the need forms the foundation of the entire project. External stakeholders, driven by their own agendas, may influence the perceived need, but it is essential to ensure that the defined need genuinely addresses the challenges faced by the community.

Table 2 Dimensions identified for an evaluation tool

Key success factors for initiating educational projects	There needs to be a clearly defined community requirement to justify the project
	The mandate of the NGO delivering the project needs to align to the project initiative
	The priorities of the donor funding the project need to align to project
	All stakeholders for the project need to have a shared vision and expectations
Key success factors for designing educational projects	The community due to benefit from the project must be involved in project design
	When the funding is required, the donor must pay promptly to avoid project delays
	The government must respond promptly to issue *no objection certificates*
	Resources must be allocated that are appropriate in quality and number
	A detailed logical (log) framework must be developed to guide project progress
Key success factors for implementing educational projects	The NGO must undertake internal monitoring of progress to achieve deliverables
	The donor must undertake external monitoring of the NGOs performance
	The NGO must manage the expectations of the benefitting community
	The donor must liaise with the benefitting community to gather feedback
Key success factors for evaluating educational projects	The project deliverables must be fulfilled in accordance with project aims
	The target community's satisfaction must be compared to agreed indicators
	The satisfaction of the donor must be compared to agreed indicators
	The project's level of sustainability must be compared to agreed indicators
	The ownership of deliverables must be transferred to the benefitting community
	Lessons that can be learnt must be captured for the benefit of future projects

Source: Authors' Own Work

Participants emphasized the significance of considering geographic and demographic factors in understanding the community's context and tailoring the project to meet their specific needs. Furthermore, it is important for donors to align their priorities with the identified community needs, avoiding unrealistic expectations or shifting funding to other projects without considering the impact on the community. Establishing a shared vision amongst all stakeholders is necessary to ensure

everyone is working towards the same goals and deliverables, regardless of their motivations.

The second theme is about designing educational projects and highlights the importance of involving the community that will benefit from the project in the design process. Participants stressed that close collaboration between the donor, NGO, and the community is necessary to ensure project feasibility and that the deliverables are fit for purpose. This participatory approach resembles action research, enabling the integration of project outputs and outcomes within the community. The timing of funding release by donors becomes a critical factor, as delays can disrupt project activities and potentially render the project irrelevant or outdated. Delays in obtaining government approvals, such as the no objection certificate, can also hinder project progress and result in missed opportunities. Adequate resource allocation is essential for successful project delivery, and careful planning is required to ensure the availability of necessary resources at the right stages of the project. Under-resourcing or over-resourcing can both lead to project failure and dissatisfaction within the community. Developing a logical framework, helps stakeholders agree on the sequence and timing of project activities, contributing to comprehensive project planning and effective teamwork.

The third theme considers the implementation of educational projects and highlights the importance of external monitoring of NGO performance by the donor. As the donor invests resources in the project, they need to ensure the NGO operates with integrity and that the project's funds are appropriately utilized. Regular monitoring throughout the project's duration is necessary to address any issues that may arise and avoid problems later on. Managing the expectations of the benefiting community becomes crucial, as their desires and needs may extend beyond the defined scope of the project. The NGO must effectively communicate and manage these expectations, adhering to the agreed-upon project activities and funding limitations. Maintaining objectivity in collecting feedback from the community is challenging for the NGO, making the donor better positioned to gather feedback related to project deliverables, process, and decisions. The donor's role in liaising with the community for feedback ensures fairness, objectivity, and the community's active involvement in assessing the project's outcomes.

The fourth theme supports the evaluation of educational projects and underscores the importance of assessing their impact and satisfaction levels. Project deliverables should be fulfilled completely and in line with the project's aims, as partial fulfillment can undermine the project's overall value. Evaluating satisfaction levels involves engaging with both the benefitting community and the donor. Agreed-upon indicators and targets must guide the assessment, considering aspects such as educational inclusion, equity, opportunity, and the community's self-sufficiency. The NGO must ensure the transfer of ownership of project deliverables to the community, empowering them to use, manage, and maintain the outcomes over time. This contributes to the project's sustainability and long-term impact. Finally, the stakeholders should conduct a thorough review of the project, capturing lessons learned, and documenting both good practices and challenges faced. Lessons learned are

valuable for future projects, enabling the building upon successful approaches and avoiding previous pitfalls.

When considered together, these discussions highlight the significance of several key success factors for initiating, designing, implementing, and evaluating educational projects. Accurate identification of community needs, shared vision among stakeholders, community involvement in project design, effective resource allocation, external monitoring of NGO performance, and comprehensive evaluation processes are crucial for achieving successful educational initiatives. The findings provide valuable insights for project managers, NGOs, donors, and policymakers involved in educational development projects, emphasizing the need for collaboration, adaptability, and a focus on long-term sustainability to address the complex challenges in education.

7 Conclusion

The United Nations has created 17 Sustainable Development Goals (UN SDGs), known as global goals, to which all countries are encouraged to support so that they can be achieved by the year 2030.

In Pakistan, projects aimed at SDG-4 (quality education) have a top priority as the goal relates to the provision of an inclusive education for all, and promotes the rationale that all people have a right to an education that is accessible, free of charge, and tailored to their individual needs. Quality education should also prepare people to enable them to contribute to the long-term growth and prosperity of their own communities.

In Pakistan, NGOs are collaborating with the government to improve the country's education system through the delivery of educational projects. Ensuring the timely completion of these projects is important if the aspirations of SDG-4 are to be achieved by 2030.

Project management is a relatively new concept in Pakistan. This research has therefore taken a case study approach to consider the key factors that NGOs need to take into account when monitoring the progress, and success, of their educational projects. Interviews have been undertaken with 25 key stakeholders from NGOs delivering projects, donors who are funding projects, and government representatives who are supporting projects.

From this qualitative study, new understanding has been created that can form the basis for an evaluation tool that can be used to drive project success. The tool follows the lifecycle of the project from beginning to end. This is important as most educational projects are in fact community based, i.e., they are addressing a genuine community need, and the deliverables of the project will reside with the community after the end of the project. It is therefore essential that community engagement starts from the initial concept of the project as how otherwise can we hope to develop something that they value and use.

Whilst developed for NGOs delivering quality education projects in Pakistan, the dimensions for an evaluation tool identified are thought to be applicable to projects delivered by other types of organizations, and in other countries, but further research will need to be undertaken to explore this concept.

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Part VI
Eurasian Economic Perspectives: Growth and Development

Positioning the Croatian Environmental Kuznets Curve in a European Context



Djula Borozan and Luka Borozan

Abstract The existence of the environmental Kuznets curve (EKC) has attracted growing research interest worldwide. This paper uses a panel autoregressive distributed lag model to examine the relationship between environmental quality and economic development in Croatia in a European context. Energy consumption, environmental taxes and human capital are treated as control variables. Economic development is measured by real gross domestic product per capita, while environmental quality is proxied by greenhouse gas (GHG) emissions. The statistically significant existence of the U-shaped form is confirmed for the entire sample consisted of European countries in the long run, suggesting that economic development itself cannot reduce harmful emissions. In the short run, on the other hand, there is not enough evidence to validate the existence of this shape, neither for the EU as a whole nor for Croatia. Therefore, the results confirm that the relationship of interest is a long run phenomenon. The results also show that energy consumption, environmental taxes, and human capital significantly influence GHG emissions in the long run. Unlike in the EU, where the effect of these variables is not significant, energy consumption and human capital in Croatia demonstrate statistically significant short-term impacts on GHG emissions.

Keywords Environmental quality · Economic development · Autoregressive distributed lag (ARDL) model · Human capital · Environmental taxes

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1 Introduction

Economic growth is essential for achieving sustainable prosperity and the cohesion of countries by ensuring that they use their resources efficiently and sustainably without unnecessary harmful emissions. The importance of economic growth in the world has increased recently, particularly with the Great Recession and the Covid-19 recession. An ever-changing economic and business environment caused by exogenous shocks, such as the war between Russia and Ukraine, intensifies the importance of the growth. A country's economic actors are responsible for using their resources more efficiently and constantly innovating technological processes and infrastructures to grow and attract talents in today's highly competitive world, while bearing in mind their environmental role.

The urgent need to curb global warming and climate change has attracted a lot of attention especially in the last decade. Following the Summit in Paris and the United Nation Sustainable Development Goals (UN SDGs), a consensus was reached to restrict global warming to under two degrees in relation to pre-industrial levels (UNFCCC, 2016).

There is an ongoing debate about the relationship between economic growth and environmental quality (for a review, see Mardani et al., 2019). Rapid economic growth can be detrimental to the environment and cause multiple damages from the sustainable development perspective. However, economic growth is necessary because it can improve the standard of living and even enhance environmental quality. The theory behind the environmental Kuznets curve (EKC) states that emissions rise with economic growth until a certain turning point, after which they decrease, even though economic growth continues to be present. It thus assumes that the EKC follows an inverted U-shaped pattern. Based upon the pioneering contributions of Grossman and Krueger (1991), Shafik and Bandyopadhyay (1992) and Panayotou (1993), numerous empirical studies have appeared over the past two decades that concentrating on the interplay between economic growth and environmental well-being. However, their results are inconclusive. Some of them confirmed the validity of the EKC, but some of them found no evidence to support its existence. For a review of the EKC literature, see Shahbaz and Sinha (2019).

There are also inconclusive empirical results for the European Union (EU), confirming the sensitivity of the EKC to model specification, sample size, time span and method applied. Lapinskiene et al. (2015, 2017a, 2017b), Destek et al. (2018) or Borozan (2022), for example, provided evidence for its existence, while Boluk and Mert (2014) or Auci and Trovato (2018) failed to do that. However, in contrast to the large and growing interest of scholars at the EU or world level in exploring the link between economic growth or development and environmental quality, this has not been the case in Croatia, which is the focus of this paper. Indeed, only a few studies examined the presence of the EKC in Croatia.

Ahmad et al. (2017) corroborated the validity of the long-term inverted U-shaped form between carbon dioxide (CO_2) emissions and economic growth (measured by real gross domestic product, GDP) in Croatia. They employed the autoregressive

distributed lag (ARDL) approach in a bivariate setting for the period 1992Q1–2011Q1. Using a linear regression for the linear, quadratic and cubic GDP forms, Josic et al. (2016) tested its validity in the period 1990–2013. They extended the latter GDP model to include the trade openness and population density variables. However, they found only a very weak linear relationship that holds for the short run model dynamics. Skrinjaric (2019) came to the same conclusion. She also detected a weak positive linear association between the selected pollutants and income, but failed to corroborate the validity of the EKC in a quadratic model specification at the county level for the period 2008–2016. Other studies (e.g., Mor & Jindal, 2012 or Borozan, 2022) included Croatia in the sample of countries studied. While Allard et al. (2017) observed the existence of the N-shaped EKC in all income groups (including Croatia), except for upper middle income economies, Mor and Jindal (2012) and Borozan (2022) placed Croatia in the group of countries to which a U-shaped form between GHG emissions and economic development was detected. Here, Allard et al. (2017) and Borozan (2022) applied panel quantile regression analysis, while Mor and Jindal (2012) used a static panel regression analysis. This brief review of the literature and the inconclusive empirical results found for Croatia motivate us to conduct this research. Thus, this paper aims to investigate the short- and long-term relationship between environmental quality and economic development in the EU with a particular focus on Croatia for the period 2004–2018.

Unveiling the interplay between economic advancement and adverse emissions is especially important for the EU as a whole since it is still the third largest emitters in the world (World Resource Institute, 2020). It also is important for Croatia, which belongs to EU countries that emit the small quantities of harmful emissions. Figure 1 graphically illustrates the situation with GHG emissions in the EU. Nevertheless, Croatia, like other EU countries, is committed to becoming a low-carbon economy. It adopted the Low-Carbon Development Strategy Until 2030 with a View to 2050

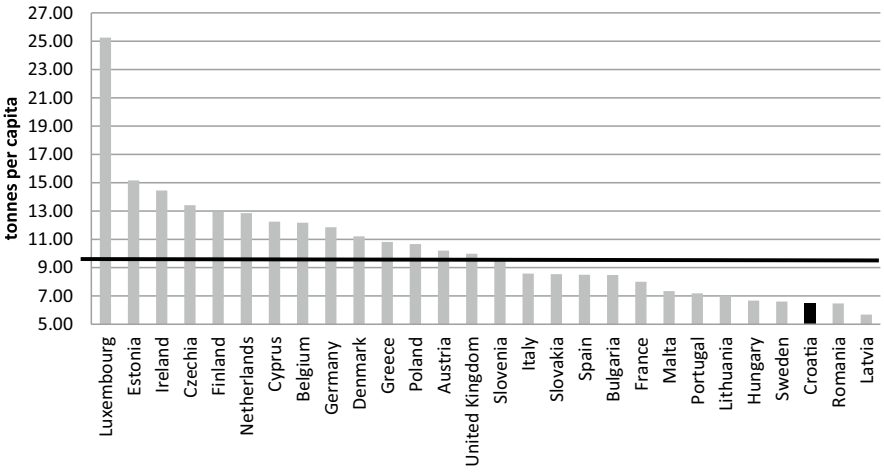


Fig. 1 GHG emissions in the EU for the period 2004–2018. Source of data: Eurostat, 2021a

(Ministry of Economy and Sustainable Development, 2021). The Strategy envisages an ambitious reduction in emissions from the 1990 level to 80% by 2050. At the same time, the National Development Strategy 2030 (2021) assumes strong economic growth, which is necessary given the country's lag behind leading post-transition EU countries. In the past two decades the EU along with Croatia has witnessed turbulent economic growth caused by financial and economic crises and recently by the Covid-19 pandemic. Therefore, the results obtained for Croatia, which are empirical in nature, can be particularly valuable for post-transition EU countries that belong to the same group—the group with lower GHG emissions. Apart from this empirical contribution to the EKC literature, the paper's development of a multivariate framework for examining the presence of the EKC in Croatia holds further significance. Indeed, this framework incorporates policy variables and human capital, both of which possess the potential to substantially influence CO_2 emissions in conjunction with economic growth, thus providing an additional contribution to the EKC literature.

The remainder of the paper is structured as follows. Section 2 briefly presents the data and method used in the analysis. Section 3 introduces and discusses the results obtained, while the last section wraps up the paper.

2 Model, Data, and Methodology

To explore the relationship between environmental quality and economic development, this study set the following empirical model.

$$ghg_{it} = f\left(gdp_{it}, gdp^2{}_{it}, energy_{it}, envir_tax_{it}, h_capital_{it}\right), \tag{1}$$

where i represents EU countries (i = 1, …, 28) and t stands for a selected years (t = 2004, …, 2018). GHG emissions (*ghg*) are used as a proxy for environmental degradation. The variable is measured in CO_2 equivalent units, representing the aggregated national emissions of the 'Kyoto basket', and is adjusted by the average population of the baseline year. The *gdp* variable, expressed in 2010 euro per capita, represents the impact of economic development, as is common in studies of the EKC literature. It is included in the model in a quadratic form to test for the presence of the inverted U-shaped pattern of the EKC. The *energy* variable pertains to final energy usage, quantified in million tons of oil equivalents (TOE). Its incorporation in the model acknowledges its role as a significant contributor to detrimental GHG emissions. The policy variable is represented by environmental taxes (*tax*) related to energy, transportation, pollution, and resources. It is incorporated into the model as a proportion of the GDP. Consistent with theoretical predictions, environmental taxes are anticipated to encourage a more effective resource utilization; therefore, we assume that they will have a favorable impact on GHG emissions. Finally, the *h_capital* variable is a representative of human capital, on which much depends on how resources are used and how quickly

technological processes and technologies are generally innovated. The variable is expressed as the percentage of persons with tertiary education and/or employed in science and technology in the active population. The source of all data is Eurostat (2021b).

The paper employs autoregressive distributed lag (ARDL) error-correction model by Pesaran and Shin (1999) to estimate the parameters of the model specified following Asteriou et al. (2021)

$$ghg_{it} = \alpha_i + \sum_{j=1}^{p} \beta_0 ghg_{it-j} + \sum_{j=0}^{q} \beta_1 gdp_{it-j} + \sum_{j=0}^{q} \beta_2 gdp^2{}_{it-j} + \sum_{j=1}^{q} \beta_3 x_{it-j} + u_{it} \quad (2)$$

$$\Delta ghg_{it} = \alpha_i + \varnothing_i \left(ghg_{it-j} - \theta_1 gdp_{it-j} - \theta_2 gdp^2{}_{it-j} - \theta_3 x_{it-j} \right) + \sum_{j=1}^{p-1} \gamma_{it} \Delta ghg_{it-j} + \sum_{j=0}^{q-1} \gamma'_{ij} \Delta gdp_{it-j} + \sum_{j=0}^{q-1} \gamma''_{ij} \Delta gdp^2{}_{it-j} + \sum_{j=1}^{q-1} \gamma'''_{ij} \Delta x_{it-j} + u_{it} \quad (3)$$

By reparametrizing Eq. (3):

$$ghg_{it} = \beta_0 + \sum_{j=1}^{m} \beta_{ij} gdp_{it-j} + \sum_{j=1}^{m} \beta_{ij} gdp^2{}_{it-j} + \sum_{j=1}^{n} \beta_{ij} energy_{it-j} + \sum_{j=1}^{\rho} \beta_{ij} envir_tax_{it-j} + \sum_{j=1}^{k} \beta_{it} h_capital_{it-j} + \mu_i + \varepsilon_{it}, \quad (4)$$

where *i* and *t* denote country and time, respectively, *x* is a set of control variables: energy consumption, environmental taxes and human capital. Notations γ, γ', γ", γ"' are the short run coefficients of the lagged dependent variables, and Φ_i shows the speed of adjustment.

The model's parameters are estimated through the utilization of two estimators: the Pooled Mean Group (PMG) estimator and the Mean Group (MG) estimator. As underlined by Blackburne and Frank (2007), the PMG estimator integrates coefficient pooling and averaging, whereas the MG estimator assesses N time-series regressions and subsequently averages the coefficients. To determine the true estimator, the Hausman test is employed.

3 Results with Discussion

Table 1 provides the descriptive statistics for the variables encompassed within the model. Croatian consumers evidently use less energy and emit fewer GHG, have lower real GDP per capita, and have less people with tertiary education and/or employed in science and technology compared to the EU average. However, the Croatian government collects more taxes as a percentage of GDP.

Table 1 Summary statistics

Variable	Symbol	Obs	EU				Croatia			
			Mean	Std. Dev.	Min	Max	Mean	Std. Dev.	Min	Max
Greenhouse gas emissions (tones of Co_2 equivalent per capita)	*ghg*	420	10.23	4.05	5	30.8	6.47	0.57	5.70	7.40
Real GDP per capita (in 2010 euro per capita)	*gdp*	420	24,789.67	15,954.52	3890	84,420.00	10,746.67	604.88	9780.00	11,990.00
Final energy consumption, million TOE	*energy*	420	40.69	53.71	0.45	225.39	6.93	0.34	6.24	7.40
Total environmental taxes (% of GDP)	*envir_tax*	420	2.64	0.60	1.56	4.99	3.14	0.33	2.56	3.59
Persons with tertiary education and/or employed in science and technology (% of active population)	*h_capital*	420	41.71	8.98	20.9	64.5	32.43	4.13	27.20	40.00

Source: own work

Before the panel ARDL model is applied, panel unit root tests—the Im-Pesaran-Shin (IPS) unit-root test and the CIPS (Cross-sectional augmented IPS) test that accounts for cross-sectional dependence—were conducted to check the time properties of the variables. The results, given in Table 2, provide enough evidence to confirm that the GDP, GHG and environmental tax variables are $I(1)$, while the human capital and energy consumption variables are $I(0)$.

In addition, the null hypothesis of cross-sectional independence was also rejected by the Peseran test of cross-sectional independence (Peseran's test = 2.306; $p < 0.05$). This is to be expected given the geographic area and the degree of political and economic integration. Moreover, the delta test and the adjusted delta test of Pesaran and Yamagata help us reject the null hypothesis that the slope coefficients are homogenous ($\tilde{\Delta} = 8.712$; $\tilde{\Delta}_{adj.} = 811.929$; $p < 0.01$). The modified Wald test for groupwise heteroscedasticity points to the presence of heteroscedasticity ($\chi^2(28) = 14772.96$, $p < 0.01$). Given the results of these tests, the panel ARDL method can be employed to test the relationship between the variables of interest. This method is appropriate even when the variables exhibit differing orders of integration.

The parameters are estimated using the PMG and MG estimators. However, in Table 3, only the results of the PMG estimator are reported since the Hausman test suggests the preference of the former. Since the PMG estimator allows for the short-term responses across countries, Table 3 also reports the short run results for Croatia.

A significant negative sign of the GDP variable and a positive sign of the GDP squared variable corroborate the existence of the U-shaped form for the EU as a whole and Croatia in particular in the long run, but not in the short run. The

Table 2 Stationarity test results

	IPS unit-root test		CIPS test	
	Constant only	Constant & trend	Constant only	Constant & trend
	t-bar	*t*-bar	CIPS	CIPS
Test in levels				
ln(ghg)	−1.5418	−2.3547***	−2.328	−2.513
ln(gdp)	−1.614	−1.5620	−1.688	−2.169
ln(energy)	−1.7971**	−2.3043	−2.300**	−2.912***
h_capital	−1.5083	−2.1882	−2.135**	−2.701**
envir_tax	−1.2210	−1.9250	−1.635	−2.531
Test in first difference				
ln(ghg)	−3.9639***	−4.0721***	−3.974***	−4.136***
ln(gdp)	−2.4088***	−2.5955***	−2.624***	−3.011*
ln(energy)	−4.1234***	−4.0833***		
h_capital	−3.2145***	−3.2819***		
envir_tax	−3.2355***	−3.3038***	−3.670***	−3.611***

Source: own work

Note: the null hypothesis: panels contain unit roots. *, **, *** signify the rejection of the null of a unit root for 99%, 95% and 90%, respectively. Critical values: without trend: −2.07 (10%), −2.17 (5%), −2.34 (1%); with trend: −2.59 (10%), −2.69 (5%), −2.88 (1%)

Table 3 Results of PMG estimator

Variable	Period	EU (121000)		Croatia	
		Estimated coefficient	Standard error	Estimated coefficient	Standard error
ln(gdp)	Long run	−0.474***	0.020		
ln(gdp²)		0.009***	0.001		
ln(energy)		0.678***	0.016		
envir_tax		−0.097***	0.005		
h_capiital		0.007***	0.001		
ECT	Short run	−0.277***	0.096	−0.027	0.067
Δln(gdp)		−10.030	55.965	22.536	27.924
Δln(gdp²)		0.405	2.640	−1.187	1.500
Δln(energy)		0.523*	0.080	0.569***	0.140
Δenvir_tax		0.020	0.018	0.044*	0.025
Δh_capital		−0.001	0.004	−0.018***	0.004
Constant		1.100***	0.382	0.117	0.284
Log-likehood	1067.201				
Obs.	392				
Hausman test	$\chi^2(4) = 5.81$; $p = 0.214$				
Jarque-Bera normality test	$\chi^2(2) = 7.016$; $p = 0.03$				

Source: own work

Note: ***, ** and * signify 1%, 5% and 10% levels of significance, respectively. *Δ stands for* the first difference of the variable

relationship between GDP and the environment is a long run phenomenon that has already been observed in the literature. This result indicates the absence of the EKC in the EU, which is in line with some other findings (Lapinskiene et al., 2015, 2017a; Kasman & Duman, 2015; Armeanu et al., 2018; Neagu, 2019), but contradictory to others (Boluk & Mert, 2014; Mazur et al., 2015). The inconclusive results found in the literature about the specific form of this relationship clearly confirm its sensitivity in terms of model specification, sample size, time span and method applied. Evidently, this relationship avoids being determined in an unambitious manner. New knowledge is needed. It is interesting to note that, according to Table 3, the decreasing branch of the relationship is considerable more important than its increasing branch, as has already been noted in the literature (Auci & Trovato, 2018). This is especially pronounced in the short run, although this impact is insignificant.

As expected, a rise in final energy consumption leads to statistically significant increases in GHG emissions both in the short and long run. Evidently, enhancing energy efficiency, fostering energy conservation, and advocating for a shift towards more environmentally friendly energy mixes become crucial imperatives. Indeed, energy consumption is one of the largest sources of anthropogenic GHG emissions and previous literature confirms its important role in mitigating GHG emissions (e.g., Liobikiene & Butkus, 2017; Auci & Trovato, 2018; Sarkodie & Strezov, 2019).

The negative association between environmental taxes and GHG emissions points to the important role that environmental and energy policies can play in this regard. An increase in environmental taxes leads to a decrease in GHG emissions in the long run. A higher tax burden puts pressure on the adoption of sustainable energy, products and services, which in turn leads to a decrease in GHG emissions. Its important role in this regard is proved, for example, by Morley (2012), Boluk and Mert (2014) in the EU, although contrary results can also be found in the literature (e.g., Borozan, 2018). In the short run, this relationship holds no significance in the EU, unlike in Croatia, where there is a weak positive statistically significant relationship between them. The reasons for this can lie in the Croatian tax system, particularly environmentally taxes, which has been a subject to frequent changes. However, at the same time, despite the frequent changes, the tax system has failed to introduce a number of environmentally relevant charges already prescribed by law, and reformed itself into a modern system focused on carbon tax (Majic et al., 2021).

Human capital significantly influences GHG emissions in the long run. More educated and trained people are more aware of the consequences of GHG emissions. Conversely, they generally possess greater financial resources, which they use to buy more environmentally friendly products and services. The results suggest that they rebound in the long run. This is not entirely unexpected as innovations in energy efficiency and energy saving together with the development of new appliances increase the demand for energy and energy services. This can translate into higher energy consumption and, consequently, higher GHG emissions from better educated people. Several researchers have highlighted the existence of the rebound effect within the EU attributed to individuals with higher levels of education. Vivanco et al. (2016), Borozan (2019) and. Bjelle et al. (2018) showed that preventing this effect can lead to a reduction in harmful emissions. This finding implies an important role for policy in encouraging changes in consumer habits and behavior.

The error correction term exhibits a significantly negative value, indicating the model's convergence towards its long-term equilibrium. In situations where deviations occur, they can be corrected at a rate of 24.5% and be short lived.

4 Conclusion

Utilizing a panel autoregressive distributed lag model, we have gathered evidence that supports the existence of a U-shaped curve, widely recognized as the environmental Kuznets curve. This curve implies that neither the Croatian nor the EU economies would inherently reduce their GHG emissions as a result of economic development (measured in terms of real GDP per capita) over the long term. Furthermore, modelling shorter intervals yielded no evidence to support the same conclusion; hence we concluded that the phenomenon of interest can only be observed over longer periods of time. Additionally, the long-term results suggested that the control variables (energy consumption, environmental taxes, and human

capital) significantly influence GHG emissions for both Croatia and the EU. However, the short-term results are different – EU GHG emissions remain unaffected by these variables, but in the case of Croatia, there is a statistically significant relationship.

Croatia and other EU countries need to take significant action to reduce their carbon footprint and take measures towards environmental sustainability and sustainability in energy consumption and production to become carbon neutral by 2050. This will require the transformation of the entire European economy, but will also create new opportunities for investment and jobs. Croatia has already made progress along this path; however, the transformation process should be accelerated and further research should address this challenge. Furthermore, the paper's limitation lies in its coverage from 2004 to 2018. A more extensive exploration over an extended timeframe and the integration of alternative techniques to address the issues such as cross-sectional dependence would facilitate a deeper understanding of the EKC. Additionally, significant disruptions, such as the Covid-19 pandemic, Russia's aggression in Ukraine, energy crises, and escalating inflation, transpired after the investigated period. These events might substantially influence the relationship between economic advancement and environmental well-being, especially within a shorter timeframe. Future research on the EKC should encompass a broader temporal range, embrace newly developed methodologies, and address contemporary challenges while investigating their short- and long-term effects.

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An Analysis of the Extent of Economic Measures During the Covid-19 Pandemic



Tomas Fisera and Jan Cernohorsky

Abstract The aim of this paper is to assess the extent of economic measures for 168 countries with a more detailed focus on Sweden, Singapore and the Czech Republic and then to recommend a possible future course of action to governments. We use a database of six indicators characterizing: (i) fiscal measures, (ii) interest rate changes, (iii) macro-financial measures, (iv) other monetary policy measures, (v) exchange rate measures, and (vi) other exchange rate measures. Next, we use our own modification of the economic stimulus index constructed by principal component analysis. Sweden introduced the most extensive economic measures, while the economic measures of the governments of Singapore and the Czech Republic were at about half level. We see the timeliness, adequacy, breadth and consistency of government action as a most economically efficient approach. We recommend the adoption of fundamental reforms, e.g. a higher share of indirect taxes or sustainable financing of pension and health care systems, where increasing the level of taxation in the form of selective consumption taxes can be seen as effective. Another key recommendation is the importance of investing in digital infrastructure to enable, for example, greater flexibility in the labor market or greater efficiency in public administration.

Keywords Economic measures · Pandemic · Macroeconomic analysis · Principal component analysis · Economic stimulus index · Government

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1 Introduction

In contrast to what has been common in previous decades, economies around the globe are not at present developing continuously with respect to fixed long-term growth rates, in which standard and relatively predictable phases of economic growth alternate with decline. Each and every economy has received unpredictable non-economic shocks, which have had a fundamental economic impact.

The Covid-19 pandemic and the economic restrictions associated with it are an extraordinary—and previously unprecedented—shock to most of the world's economies. Even though this was a one-time exceptional shock, we have largely stopped feeling its economic impact in 2022. Unfortunately, however, other exceptional shocks have been occurring, such as enormous increases in energy and fuel prices.

For this reason, it is important to analyze the extent of the government measures taken in reaction to the exceptional situations that have recently been occurring and impacting real economies. There has been enormous pressure on public finances. These have been used to cover the striking increase in expenses for supporting commercial and non-commercial entities and families. On the other hand, public finances have been afflicted with a distinct drop in income, because tax revenues have declined as a result of decreased economic activity or profitability. Unfortunately, such deficiencies are not subsequently, nor were they previously, compensated for by budget surplus in times of economic growth. Since the financial crisis in 2008, the second pillar of economic policy, monetary policy, has been applied expansively in order to influence economies. In many countries or economic clusters, there has not been room to further loosen monetary policy.

Therefore, the goal of this paper is to evaluate the extent of 168 countries' economic measures with a more detailed focus on Sweden, Singapore, and the Czech Republic; to subsequently recommend possible governmental steps for the future; and to propose alternative measures. The countries were chosen based on different economic policies, representing a liberal approach (Singapore), an interventionist approach (Sweden), and the Czech Republic, which is situated on the border between these approaches. This paper will contribute to the existing literature by summarizing a number of relevant studies that have investigated governments' economic reactions during the Covid-19 pandemic, including an overview of the various statistical methods that were used in these analyses. Next, the analytical section starts with the macroeconomic indicators that were used in studies by the authors Elgin et al. (2020) and Shafiullah et al. (2022). Our index is based on the same indicators as the stimulus index by Elgin et al. (2020), but it utilizes available data for May 2021, whereas Elgin et al. (2020) relied on very early data from March 2020 when the Covid-19 pandemic was globally in its early stages and the extent of economic measures in many countries was not as significant. Additionally, we are testing the suitability of using a statistical method, through the Kaiser-Meyer-Olkin test. We used principal component analysis (PCA) to standardize these into an aggregate index in order to specify the scope of the implemented government measures and to make them comparable at an international level. Finally, the paper lists

the deficiencies and potential challenges encountered when constructing and subsequently applying the aggregate index as well as recommendations for economic policymaking bodies on dealing with similar exceptional shocks that are based on evaluating the Covid-19 pandemic's impact on the global economy. Moreover, we propose further modifications to the given index in order to better evaluate the extent of economic measures reacting to extraordinary shocks in the future.

2 Theoretical Background

After the onset of the Covid-19 pandemic and its ensuing measures, the professional public tried to analyze the necessity and scope of government interventions that were implemented to support the economy. Despite the enormous wave of uncertainty caused by the Covid-19 pandemic, a whole range of studies concerning the prediction of future developments began to appear. McKibbin and Fernando (2021) assessed its global macroeconomic impact in seven various scenarios by using a hybrid general equilibrium model combining the dynamic stochastic general equilibrium (DSGE) and computable general equilibrium (CGE) models. The authors primarily emphasized the importance of fiscal, monetary, and health policies when dealing with similar crises and indicated that supporting investment into health care was crucial, especially for less developed countries. Maliszewska et al. (2020) used the same model for predicting its impact on global GDP and concluded that global GDP in 2020 would drop on average by 2% year-on-year, or by 4% if the pandemic intensified. In addition to being applied to the global economy, a modification of the CGE model was used to evaluate short-term and long-term economic and environmental impact in France. As to economic impact, the authors predicted a drop in GDP of 5.1%, an upward jump in the unemployment rate of 2.9%, and most significantly, a year-on-year drop in investment of 11% (Malliet et al., 2020). In addition to all the various modifications of CGE models, other mathematical-statistical methods have also been used for prediction. For example, Albu et al. (2020) came up with an application of differential equations and a construction method for special logistical time functions so they could estimate the development of GDP for the remainder of 2020 across the world, in the EU, and in Romania.

Governments around the world adopted numerous stimulus packages to support the economy—in the USA alone, their amount surpassed USD 2 billion (Bayer et al., 2020). However, there were distinct differences between various national governments' reactions during the pandemic, which creates the distinct opportunity to compare the types of policy tools that were used as well as the factors that led to their selection. Providing liquidity to the banking sector was the most frequent form of support in the area of monetary policy, whereas for fiscal policy, this included transfers to households and businesses, covering costs for temporary layoffs, increasing aid in the area of social security, etc. (Capano et al., 2020). Because of marked differentiation between countries regarding their implemented measures, a number of studies have focused on the scope and standardization of the measures

taken to stimulate the economy. For this purpose, Elgin et al. (2020) used principle component analysis to construct a completely new Covid-19 Economic Stimulus Index (CESI), which makes it possible to compare the scope of the steps different countries have taken according to type of policy measure: fiscal, monetary, and other. Using the resulting correlation index with selected indicators, the authors determined that the governments' economic reactions tended to be aimed more at protecting against the spread of infection than resolving negative economic impact. Immediately upon first glance, the index itself displays a whole range of limitations, e.g., it is based on relatively new data, namely from March of 2020. Essentially, however, it does contribute to a better understanding of the Covid-19 pandemic's economic repercussions. Alternatively, Siddik (2020) tried to measure the scope of stimulus packages by proposing a multidimensional index that standardized governments' economic reactions, in which he used indicators similar to those in the study by Elgin et al. (2020). In this case, euclidean distance is applied to develop a new index, and subsequently beta regression is employed to identify determinants of Covid-19 economic stimulus. Implementing the restrictive measures also caused a fundamental stock market reaction, in which it recorded a steep drop along with the pandemic's arrival. Shafiullah et al. (2022) therefore focused on investigating the relationship between the stock market plunge and the size of stimulus packages. In their work, they monitored the reaction of the CESI index by Elgin et al. (2020) on stock market volatility. They concluded that a greater stock market decline led to a larger economic stimulus package. However, this effect was observed only in advanced and high-income countries whose GDP per capita was higher than the median GDP per capita.

Unfortunately, in addition to supporting the economy, the stimulus packages adopted by governments also had a marked influence on individual countries' economic results. The critical analysis by Heald and Hodges (2020) noted their undeniable impact on government revenues and expenses within the sphere of the United Kingdom's public finances, in which government revenues dropped by 12% for the period of April to June 2020, while government expenses grew by 36% in comparison with the previous year. Gupta and Jalles (2022) also note in their study that there has been a significant increase in government expenses and a decrease in government revenues during the Covid-19 pandemic. However, they point out that the pandemic affected government expenses more than government revenues in advanced economies, while the converse applies to developing countries. In 2020, most countries went distinctly into debt, because a national budget deficit was virtually unavoidable in the wake of the various restrictions and limitations. Thus, a more frugal way to manage the economy will be a critical subject in the post-pandemic period, as will higher efficiency in the form of greater digitalization and accepting key reforms to support sustainable public finances (Clemente-Suárez et al., 2021). Specifically, the Covid-19 pandemic overturned the already highly vulnerable public finances of the world's countries. For a long time already, it hasn't been typical for governments to generate positive economic results in times of economic growth. Makin and Layton (2021) expect that increasing public debt will act against the economic cycle in the future—whether by unstoppable inflationary pressures after

reopening the global economy or by their related increase in interest rates. It is difficult to imagine that governments would be able to resolve public finance sustainability without increasing tax rates. However, this type of action would definitely require caution, especially concerning any possible impact on economic efficiency. Kentikelenis and Stubbs (2022) are worried about the possibility of sustainable economic growth in the time after the pandemic, especially considering the upcoming budget cuts. We have seen in the past that these austerity measures often have negative socio-economic effects, so its' important to lessen their impact.

3 Research Methodology

For constructing the index, macroeconomic data for May 2021 that was accessible from the database of the International Monetary Fund (IMF, 2020) was compiled for 168 countries. Specifically, this was data on the following six indicators: (i) fiscal measures (in % of GDP), (ii) change in interest rate (in %), (iii) macrofinancial measures (in % of GDP), (iv) other monetary policy measures (using binary data, i.e., the value equals 1 if a measure was taken or 0 if it was not), (v) exchange rate measures (in % of GDP), (vi) other exchange rate measures (using binary data). Mathematical-statistical computations were conducted exclusively in the software STATISTICA 12, SPSS, and the program Microsoft EXCEL.

The aggregate index in this paper was constructed using the PCA method. This multidimensional statistical method aims to transform the original variables into a smaller number of so-called latent variables (primary components), which have more suitable characteristics than the original variables—there are (distinctly) less of them, they explain almost all of the variability of the original variables, they are mutually uncorrelated, and they are a linear combination of the original data variables (Karamizadeh et al., 2020). The first of the primary components always describes the greatest variability in the data with the later components simultaneously lacking an explanation of the preceding component's variability and also carrying other information about the data's variability. In other words, each of the components represents an entirely different data dimension. Even despite their very frequent use in analysis, PCA methods have problems that are necessary to take into consideration when constructing an index. One of these fundamental deficiencies, which frequent leads to distorting the analysis as a whole, is their weak resistance to outliers.

Stanimirova et al. (2007), who dealt with missing values and the existence of outliers in their work, see the use of a more robust version of PCA as a possible solution. Next, Vyas and Kumaranayake (2006) warn of another deficiency when they state in their study that the amount of variance taken into consideration, as well as weight calculated using PCA, changes over time. Even though the authors use the same indicators (variables) as their basis, it actually happens that their values change over time; the results of various PCA (constructed for different time periods) are not directly analogical. This essentially prevents mutual comparison and points to the

fact that constructing an index using the PCA method represents a completely singular process.

In addition to potential problems using PCA, it is also necessary to mention the conditions under which PCA should be applied to a data set. Namely, it is not always true that it is suitable to apply this sophisticated method to a random data set. For this purpose, it is possible to use the Kaiser Meyer Olkin test, in which the suitability of using PCA is conditional upon the value being between the interval of 0.5 and 1. Moreover, the higher the criterion's value, the more suitable it is for using this method. Additionally, Kaiser (1960) also defined the Kaiser rule, which recommends keeping only primary components with an eigenvalue of at least one when constructing PCA. It is necessary to add that this rule is only indicative, and it is possible to deviate from it for various reasons, e.g., if the number of primary components selected in this way explains only a very small portion of the data's original variability.

4 Empirical Results

Table 1, which depicts the basic descriptive characteristics for the given 168 countries that were selected, provides an initial view of the basic data set. These characteristics are (i) average, (ii) median, (iii) minimum, (iv) maximum, and (v) coefficient of variance.

At first glance, the change in interest rate indicator stands out in particular. It can be expected that in reaction to the Covid-19 pandemic, monetary bodies would keep the interest rates low in order to support economic activity. Therefore, positive values here represent decreasing interest rates; conversely, negative values indicate their increase. An example of the latter (the only example) is Turkey, which, despite the pandemic, increased its interest rates in order to dampen its long-term prevailing inflationary pressures. Of the other characteristics, the coefficient of variance can be singled out as it gives information about the degree of variation in the data set's values. The greatest variance is clearly seen here for exchange rate measures. In addition to the individual indicators' characteristics, it is also necessary to assess the

Table 1 Descriptive characteristics of the basic data set

Indicator	Average	Median	Minimum	Maximum	Var. Coef.
Fiscal measures (in % of GDP)	7.51	4.98	−2.50	54.90	105.91
Change in interest rate (in %)	23.17	15.56	−105.56	100.00	130.56
Macrofinancial measures (in % of GDP)	7.30	3.27	0.00	64.64	137.27
Other monetary policy measures	0.95	1.00	0.00	1.00	23.86
Exchange rate measures (in % of GDP)	1.06	0.00	0.00	16.30	282.08
Other exchange rate measures	0.30	0.00	0.00	1.00	154.08

Source: Author's own calculations

potential relationships between these individual indicators, which is expressed in Table 2.

The heterogeneity of the implemented measures shows up distinctly in the weaker dependence between the indicators. Using the assumed minimum significance level of 0.5 for correlation, the only statistically significant relationship is the relationship between the two indicators of fiscal measures and macrofinancial measures (0.529). PCA itself is conducted in the next step, first by testing whether it is suitable to apply PCA but also whether the variables in the correlation matrix are uncorrelated (see Table 3).

In this case, the Kaiser Meyer Olkin criterion confirmed the suitability of applying PCA, because the value, 0.551, is within the acceptable interval of 0.5–1, albeit marginally. On the basis of the testing criterion value for Bartlett's test (80.721), it follows that the null hypothesis—that the variables in the correlation matrix are not correlated—is rejected (see Table 4). In other words, a null p-value indicates that the value of the testing criterion exceeds the critical threshold to occupy a nearly random level of significance. Since the null hypothesis was rejected, the correlation matrix must be standardized. In addition to this, it is necessary to decide on the number of primary components that will be kept for further analysis.

The table clearly shows that eigenvalues greater than one have been attained only by the first two components. Under normal circumstances, this number does not represent a problem; however, the cumulative share of these two components, which does not even reach 50%, is unacceptable. In other words, these two components only explain roughly half of the original variables' variability. Since the Kaiser rule

Table 2 Correlation analysis of economic indicators

Indicator	Fiscal measures (in % of GDP)	Change in interest rate (in %)	Macro-financial measures (in % of GDP)	Other monetary policy measures	Exchange rate measures (in % of GDP)	Other exchange rate measures
Fiscal measures (in % of GDP)	1.000					
Change in interest rate (in %)	0.032	1.000				
Macrofinancial measures (in % of GDP)	0.529	0.081	1.000			
Other monetary policy measures	0.082	0.062	0.152	1.000		
Exchange rate measures (in % of GDP)	0.135	0.116	0.054	0.078	1.000	
Other exchange rate measures	−0.187	0.049	−0.204	0.039	0.162	1.000

Source: Author's own calculations

Table 3 Assessing the suitability of applying PCA and testing for multicollinearity

The Kaiser Meyer Olkin test	Bartlett's test	
0.551	Value of the testing criteria	80.721
	p-value	0.000

Source: Author's own calculations

Table 4 Eigenvalues of the primary components

Component	Eigenvalue	The % of overall variance	Cumulative share in %
1	1.696	28.268	28.268
2	1.263	21.050	49.318
3	0.940	15.666	64.984
4	0.922	15.369	80.353
5	0.724	12.061	92.414
6	0.455	7.586	100.000

Source: Author's own calculations

Table 5 Standardized correlation matrix of indicators and components

Indicator	Comp. 1	Comp. 2	Comp. 3	Comp. 4	Comp. 5	Comp. 6
Fiscal measures (in % of GDP)	−0.633	−0.029	−0.103	−0.243	0.224	0.691
Change in interest rate (in %)	−0.127	0.434	−0.487	0.742	0.031	0.080
Macrofinancial measures (in % of GDP)	−0.646	−0.048	0.004	−0.018	0.304	−0.698
Other monetary policy measures	−0.226	0.332	0.835	0.311	−0.187	0.102
Exchange rate measures (in % of GDP)	−0.148	0.614	−0.210	−0.485	−0.551	−0.134
Other exchange rate measures	0.303	0.566	0.107	−0.239	0.720	0.000

Source: Author's own calculations

is only indicative, a larger number of components may be included. Therefore, a total of four primary components, which explain 80.35% of the original variables' variability, will be used for further analysis. Standardized using Bartlett's test because the null hypothesis was rejected, the correlation matrix of the original indicators and components demonstrates their interconnection (see Table 5).

Table 5 contains the correlations between the indicators and the individual components. Statistical significance is assumed to be the threshold when the correlation between the component and indicator exceeds the value of 0.5 when expressed as an absolute value. The first component in the sequence, which explains the highest percent of the original variability (28.27%), has a significant negative relationship with fiscal (−0.633) and macrofinancial measures (−0.646). On the other hand, the second component correlates positively with balance-of-payment measures (0.614) and other measures in this area (0.566). The third component outlines a significant relationship with other monetary policy measures (0.835), and, finally, the last and fourth component positively correlates with change in interest rates (0.742). On the basis of these findings, we can proceed to calculate the stimulus index according to the following equation:−

$$0.283 \bullet (-1) \bullet \text{COMP}_1 + 0.211 \bullet \text{COMP}_2 + 0.157 \bullet \text{COMP}_3 + 0.154 \bullet \text{COMP}_4 \quad (1)$$

These results in multiplying the individual components selected for analysis, i.e., the transformed original data, by the explanatory share of the original variables' variability. Moreover, the first component is multiplied by the value of −1, because a significant negative relationship with fiscal and macrofinancial measures was demonstrated here. Using these calculations, the values of the stimulus index were established for individual countries; they fluctuated between −1.70 and 1.20 (viz Appendix).

In addition to calculating the stimulus index, attention was also devoted to comparing the implemented measures and stimulus index values for the selected countries of the Czech Republic, Singapore, and Sweden (Table 6). These countries were selected for comparison because of their differing long-term approaches to economic policy. On one hand, Sweden has a solidarity economy with an active governmental role, while on the other, Singapore's economy has a more liberal economic approach.

The highest stimulus index value of any of the 168 countries (1.20) was attained by Sweden. It is necessary to add that this country ranked second place in the CESI Index in the original study by the authors Elgin et al. (2020), which used data for March of 2020. By the end of March 2020, i.e., within 2 months, Sweden had implemented fiscal measures amounting to 9.20% of their GDP, it had lowered interest rates by 73.33%, and it had also implemented macrofinancial measures at a rate of 9.45% of GDP, a reaction that was disproportionately higher than that of the Czech Republic (0.57) or Singapore (0.56).

When comparing the stimulus index and the CESI Index, however, it is necessary to proceed quite cautiously, because constructing each index was a unique process, which should prevent their unprecedented comparison (Vyas & Kumaranayake,

Table 6 The stimulus index and indicators for select countries

	Czech Republic		Singapore		Sweden	
Indicators	May 2021	March 2020	May 2021	March 2020	May 2021	March 2020
Fiscal measures (in % of GDP)	16.25	2.00	29.29	10.50	23.01	9.20
Change in interest rate (in %)	88.89	22.22	0.00	0.00	86.67	73.33
Macrofinancial measures (in % of GDP)	9.25	0.00	5.61	0.00	26.94	9.45
Other monetary policy measures	1.00	1.00	1.00	1.00	1.00	1.00
Exchange rate measures (in % of GDP)	0.00	0.00	16.23	0.00	11.36	0.00
Other exchange rate measures	0.00	0.00	0.00	0.00	0.00	0.00
Stimulus index	0.57		0.56		1.20	
Rank	16	53	17	27	1	2

Source: Author's own calculations

2006). Even though both indexes are constructed similarly using PCA, they diverge in that they used different macroeconomic indicator values, which means in practice that the structure of their primary components is entirely different.

5 Discussion

Both reality as well as the research we have conducted make it clear that the Covid-19 pandemic's extraordinary non-economic shock required an extraordinary and extensive economic reaction. This turned out to be a combination of fiscal, monetary, and exchange rate measures. Each country or cluster of countries reacted differently, making it relatively complicated to compare the given measures at an international level. This also was why we decided to use a standardized aggregate index in this paper.

The Covid-19 pandemic had global impact on nearly all the world's economies. In summary, this appeared as a decline in economic activity, an increase in unemployment (not in all countries), and deflationary and later inflationary pressures; it also caused a drop in investor confidence, making them withdraw their investment in risky currencies; and for a number of months, it interrupted a significant swath of international trade. Further, it emphasized the importance of fiscal policy, with monetary policy's role being to support the effectiveness of fiscal policy.

Specifically, most central banks lowered their interest rats in order to support monetary flow in the economy, which was threatened by the interruption of company activities, people's inability to work, etc. Nonetheless, 55 central banks did not change their interest rates. This was certainly caused by the fact that these central banks had not raised their interest rates to normal (non-zero) values in the previous period and thus did not have any way to lower their rates. However, central banks' economic support also consisted of many other aspects—lowering the required minimum bank reserves to resolve insufficient liquidity in the financial system, bank guarantees for covering loans, etc. At the beginning of the pandemic, only 26 of the 168 banks overall had avoided such measures, whereas this number was only nine by May of 2021, which only adds to the significance of these measures. On the other hand, during the pandemic's first phase, only 37 countries influenced their currency exchange rate to support exports and consequently the domestic economy as a whole. Even fewer—only 32 countries—reached for other measures in the area of currency exchange rates, e.g., draining reserves in conjunction with a large influx of capital in order to prevent excessive exchange rate volatility.

This correlation analysis demonstrates that the measures adopted by individual countries were relatively diverse. A certain correlation can be seen only for two indicators, fiscal measures and macrofinancial measures. We explain this by the provision of grants to companies and households, in which governments and central or commercial banks often proceeded together and complemented their programs. A specific example of this is government financial support provided via commercial banks, with the implementation approved by the central bank.

On the basis of the stimulus index calculations, the countries most active regarding the extent of their measures were Sweden (1.20), New Zealand (1.09), Italy (1.07), and Great Britain (1.00). In general, extensive measures were adopted primarily by economically advanced countries while, conversely, poor countries adopted minimal measures, which corresponds to distinctly negative index values: Eritrea (−1.70), Libya (−1.67), Turkmenistan (−1.66), Burundi (−1.63), Yemen (−1.61), and others (see the Appendix).

Of the three countries examined more closely, Sweden was distinctly the most active. According to the index, the Czech Republic and Singapore adopted less but still quite extensive measures. The original study by the authors Elgin et al. (2020) revealed that according to the CESI Index, Sweden was already in second place among all the countries for the scope of its implemented measures in March 2020—even despite the fact that Sweden's government relied on individual responsibility instead of strict prohibitions right from the pandemic's start. Moreover, it consistently kept measures in place to counter spreading infection, which later proved to be one of the most significant determinants for why Sweden's GDP fell distinctly less than it did in the Czech and Singaporean economies. Moreover, we can add that these countries, in contrast with Sweden, entirely avoided macrofinancial measures at the beginning of the pandemic. The Czech Republic's fiscal and monetary policy reactions consisted of slight fiscal stimulus amounting to 2% of GDP and a modification to the basic repo rate from 2.25 to 1.75%, which was the first of many. In contrast to this, Singapore's economy was adjusted primarily through fiscal support at a rate of 10.5% of GDP. From the stimulus index values using data for May 2021, it is, however, clear that the Czech Republic and Singapore later reacted strongly to unfavorable developments resulting from the ongoing Covid-19 pandemic. In our stimulus index, the Czech Republic is ranked at 16th place and Singapore at 17th. These countries thus implemented roughly the same extent of measures, even though the nature of their reactions were distinctly different in many ways. The greatest difference can be seen in reactions in the area of monetary policy—the Czech Republic (similar to Sweden) has been using change in interest rates as its main monetary policy instrument over the long term, whereas Singapore has been targeting exchange rate management of its local currency, i.e., the Singapore dollar. Conversely, the area of fiscal support was constructed very similarly in all three countries. Here, transfers to households and business entities hurt by the pandemic chiefly dominated, as did various types of compensation for employers' wage costs. Capano et al. (2020) also confirm that this was the most frequent form of fiscal support around the globe.

Primarily, we primarily see the timeliness, adequacy, extensiveness, and consistency of government measures as the factors that are essential to make economic measures in response to future extraordinary events effective. Even though these are criteria that are difficult to quantify, it is societies' and businesses' trust in governments and central banks, which arises precisely from the requirements listed above, that is fundamental to overcoming states of economic crisis.

It also appears to us fundamental that the adopted measures were primarily motivated by health reasons and did not take economic impact into account, as also

stated by Elgin et al. (2020). It is clear that health is in first place; nonetheless, such essential decision making influences most domestic economies in addition to a large part of these countries' international trade, and this must therefore be taken into consideration.

Further, during the Covid-19 pandemic, the importance of fiscal policy increased significantly, which is in line with the conclusions of McKibbin and Fernando (2021). Specifically, a substantial part of expenditure came out of national budgets (e.g., Heald & Hodges, 2020), even though shutting down parts of the economy meant a significant drop in government revenues. These factors have manifested themselves as enormous pressure towards sustainable public financing. In this respect, we agree with the conclusions of Clemente-Suárez et al. (2021). For this reason, we especially recommend adopting basic reforms—either concerning national budgets' expenses or their revenues. It will be necessary to find a certain yearly degree of savings concerning the aspect of expenses. Countries must learn how to save—or how to finance—their expenses from the given amount of their income. Furthermore, we propose a significantly higher percentage of indirect taxation or sustainable financing of retirement and healthcare systems, where increasing the level of taxation in the form of selective excise taxes as well as general excise duties can be seen as effective. In the case of the Czech Republic, increasing the taxation level for natural persons is unavoidable in the near future, something that is generally recommended by Makin and Layton (2021). In the case of the Czech Republic, this is because taxes for natural persons have in recent years been lowered in an unprecedented and economically unjustifiable way.

In this situation, monetary policy is able to operate only indirectly. A number of central banks lowered their interest rates or provided additional liquidity to the banking sector, as indicated by Capano et al. (2020). Central banks also supplemented these actions by performances in which they tried to calm down economic entities, express support for them, and explain how their measures would affect the economy. The question is whether it was necessary to lower the interest rates again from relatively low values to nearly zero, i.e., whether this had a real economic benefit at the given moment. It is a fact that only certain central banks had managed to increase their rates in time by a few percentage points from the zero values that had lasted since the financial crisis in 2008. Moreover, it appears at present that the results of this significantly expansive monetary policy are one of the factors for developed economies' relatively high levels of inflation.

Another essential recommendation is the importance of investing into digital infrastructure, which was stated by Clemente-Suárez et al. (2021). This will positively result in greater flexibility on the labor market and greater effectiveness on the part of national governments. Currently, it has been proven that high-quality digital infrastructure in the public and private sectors is indeed an essential aspect for increasing efficiency as well as making economic growth sustainable.

Concerning methods for measuring the extent of economic measures, we would like to propose modifying the index using Grubbs' test of extreme deviation for

eliminating extreme values in order to decrease any distortion of the data presented in the index. Further, we propose constructing the index selectively, according to the nature of the economic policy, which would make it possible to better quantify and analyze the reaction of the respective countries or even to enable specific selection according to territorial perspective or infection level. Not least, we suggest subsequently correlating the index with select macroeconomic indicators (e.g., GDP, unemployment, inflation, etc.). Naturally, we are aware that this paper deals with initial suggestions and recommendations. A further detailed approach will be the subject of later research.

6 Conclusions

The goal of this paper was to evaluate the extent of economic measures for 168 countries with a focus on Sweden, Singapore, and the Czech Republic; to subsequently recommend possible future steps for governments; and to recommend alternative measures. It is clear that the exceptional nature and unexpectedness of the Covid-19 pandemic's non-economic shock caught governments and central banks off guard. In the case of governments, these were generally lacking timely, adequate, sufficiently extensive, and consistent measures, something that tends to inspire citizens' and businesses' trust, which in turn is essential for overcoming crises. The most extensive measures were taken primarily by advanced countries with Sweden in the lead; conversely, minimal measures were implemented by poor countries. The adopted measures were relatively diverse across countries. During the pandemic, the importance of fiscal policy grew significantly, because it was precisely by this means that most of the aid was implemented. This, however, resulted in distinctly increasing countries' debt and enormous pressure to maintain sustainable public financing in the future. Therefore, reforming public financing is unavoidable for a number of countries, meaning expenses should be reduced more substantially so that these countries can cover their expenses with their revenues over the long term. We suggest having a higher percentage for excise taxes and a strong increase in tax rates for selective excise duties. Central banks supported the economy indirectly with their monetary policy by increasing liquidity or lowering interest rates. The result was greater inflationary pressures in the present. Investment into digital infrastructure will be a necessary condition for a functioning and developing economy in the future. Applying the economic stimulus index here caused us to recommend that it be modified in order to eliminate extreme values, to incorporate various economic policies, and subsequently to analyze correlation with macroeconomic indicators.

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Appendix

Country	SI	Country	SI
Sweden	1.2	Serbia	0.29
New Zealand	1.09	Hong Kong	0.26
Italy	1.07	Mongolia	0.26
Great Britain	1	Dominikan Republic	0.25
United States of America	0.87	Hungary	0.24
Japan	0.79	Estonia	0.23
Australia	0.76	Romania	0.23
Germany	0.75	Ireland	0.22
Canada	0.74	India	0.2
Chile	0.66	Cape Verde	0.18
Poland	0.63	Slovakia	0.16
Finland	0.6	Albania	0.14
Croatia	0.6	Greece	0.14
United Arab Emirates	0.58	Barbados	0.13
Bahrain	0.57	Saudi Arabia	0.13
Czech Republic	0.57	Togo	0.13
Singapore	0.56	South Afrika	0.11
Island	0.52	Pakistan	0.11
Norway	0.48	Seychelles	0.11
France	0.43	Colombia	0.1
Switzerland	0.43	Ukraine	0.1
Oman	0.42	Vietnam	0.09
South Korea	0.41	Costa Rica	0.08
Mauritius	0.41	Morocco	0.08
Peru	0.41	Papua New Guinea	0.08
Israel	0.4	Philippines	0.07
Netherlands	0.39	Bulgaria	0.06
Slovenia	0.39	Malaysia	0.06
Brazil	0.38	Indonesia	0.05
Latvia	0.38	Lesotho	0.04
Belgium	0.35	Nepal	0.04
Qatar	0.35	China	0.03
Malta	0.35	Jordan	0.02
Spain	0.34	Algeria	0.01
Cyprus	0.33	Gambia	0.01
Lithuania	0.33	Maldives	0
Luxembourg	0.33	Moldova	−0.01
Thailand	0.3	Denmark	−0.02
Guyana	0.29	Senegal	−0.02
Mexico	0.29	Montenegro	−0.03
Portugal	0.29	Ghana	−0.04
Austria	0.29	Guatemala	−0.04

Country	SI	Country	SI
Honduras	−0.04	Kosovo	−0.18
Namibia	−0.04	Mozambique	−0.18
Nicaragua	−0.04	Uruguay	−0.18
Guinea Bissau	−0.05	Bosna a Hercegovina	−0.19
Cambodia	−0.05	Gabon	−0.19
Kuwait	−0.05	Cameroon	−0.19
Panama	−0.05	Republic of Congo	−0.19
Trinidad a Tobago	−0.05	Laos	−0.2
Benin	−0.06	Liberia	−0.2
Swaziland	−0.06	Haiti	−0.21
Zambia	−0.07	Uzbekistan	−0.21
Burkina Faso	−0.08	Kenya	−0.22
Bangladesh	−0.09	Madagascar	−0.22
Burma	−0.09	Bahamas	−0.23
Bolivia	−0.09	Guinea	−0.23
Georgia	−0.09	Jamaica	−0.23
Mali	−0.09	Equatorial Guinea	−0.23
Russia	−0.09	San Marino	−0.23
Egypt	−0.1	Sudan	−0.23
Iran	−0.1	Afghanistan	−0.25
Nigeria	−0.1	Bhutan	−0.25
Sri Lanka	−0.1	Malawi	−0.25
Uganda	−0.1	Belarus	−0.26
Argentina	−0.11	El Salvador	−0.26
Azerbaijan	−0.11	Brunei	−0.27
Kyrgyzstan	−0.12	Djibouti	−0.27
Niger	−0.12	Ecuador	−0.29
Sierra Leone	−0.12	Lebanon	−0.29
Angola	−0.13	Zimbabwe	−0.29
Tonga	−0.13	Iraq	−0.3
Tunisia	−0.13	Belize	−0.31
Cote d Ivore	−0.14	Turkey	−0.41
Northern Macedonia	−0.14	Democratic Republic of Kongo	−0.89
Armenia	−0.15	Paraguay	−1.16
Kazakhstan	−0.15	Fiji	−1.18
Central Afrika Republic	−0.15	Mauritania	−1.49
Tanzania	−0.15	Ethiopia	−1.61
Botswana	−0.16	Yemen	−1.61
Rwanda	−0.16	Burundi	−1.63
Tajikistan	−0.16	Turkmenistan	−1.66
Surinam	−0.17	Libya	−1.67
Chad	−0.18	Eritrea	−1.7

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Self-Rated Health Over Time in Greece



Daphne Nicolitsas

Abstract Self-rated health has been shown to have predictive power for mortality and is thus a useful indicator to summarize the health status of individuals. We use self-rated health (SRH) to investigate how the health status of individuals changed during the severe financial crisis that hit Greece in the 2010s. The data show some deterioration in SRH but no increase in polarization or inequality. Potential explanations for these subdued changes are sought in the developments over time in some of the variables that self-rated health is associated with. More specifically, the increase in unemployment and inactivity during the financial crisis impacted on SRH—more on lowering the probability of being in a very good state rather than in increasing the probability of being in a very bad state. At the same time, however, during the crisis, the percentage of individuals smoking decreased thus compensating the deterioration in SRH from the decline in economic activity. The results presented are nothing more than associations and further research is needed to find causal interpretations of the change in SRH.

Keywords Self-rated health · Ordinal data · Polarization · Lifestyle · Economic activity

1 Introduction

The sovereign debt crisis that Greece experienced starting in the last years of the 2010s had a significant cost in terms of job and income loss. Per capita disposable income in constant prices declined by 30.6% between 2008 and the trough of the crisis in 2013. The unemployment rate increased from 7.8% in 2008 to 27.5% in 2013. The crisis did not burden the population uniformly; those with lower incomes

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and less skills suffered more and thus inequality and poverty increased (Koutsogeorgopoulou et al., 2014; Andriopoulou et al., 2018). The Gini coefficient of income inequality increased from 0.329 in 2007 to 0.342 in 2013. The P90/P10 and the P50/P10 indices suggest that it is mainly the bottom part of the income distribution that was hit.[1]

Information on the *quality of life* during the crisis has been less readily available despite the importance of complementing information on the level and distribution of income with other measures of well-being particularly for countries with a significant share of under-recorded income; Medina and Schneider (2018) estimate that in Greece the shadow economy accounts for over 20% of GDP.[2]

The focus of this paper is on one aspect of the quality of life: the health status of individuals before, during and after the Greek sovereign debt crisis.

A 2016 World Health Organization (WHO) report for Greece (WHO, 2016) states "Historically, the health status of the population in Greece was among the best in the WHO European Region…". Data on life expectancy at birth since 1980 show that this is higher in Greece compared to the EU15 although the gap, especially for men, has been closing. The above EU average health condition of the population in Greece is also clear from data on self-rated health published by Eurostat; in Greece the percentage of individuals reporting being in good or very good health is higher than in the EU.

From the available information on the health of the population, we know that the severe economic downturn did not reverse the declining trend in the overall mortality rate between 2010 and 2014 despite a substantial increase in suicides and infant mortality (Filippidis et al., 2017) and a rise in stillbirths (Tsimbos et al., 2021). Improvements in life style patterns (e.g. less smoking, increased physical activity, healthier diet) that had started before the crisis, and were not interrupted by it, together with the drop in traffic accidents could be behind the continuing declining trend in mortality.

Health-related quality of life indices and suicide attempts, from five waves of the Hellas Health Surveys between 2005 and 2015, were found, however, to be significantly negatively affected by the crisis (Filippidis *op. cit.*). As for the distribution of the deterioration in the quality-of-life burden, Filippidis *op.cit.* find no difference in the deterioration of health-related quality of life by socio-economic status (SES). Karanikolos and Kentikelenis (2016), on the other hand, report that between 2008 and 2013 EU-SILC data show a widening gap between the percentage of poor

[1] The OECD data from which the figures in the text are sourced, show that, the P90/P10 ratio was 4.4 in 2007 and 5.1 in 2013, the P50/P10 ratio stood at 2.2 in 2007 and 2.5 in 2013 and the S80/S20 ratio increased from 5.6 in 2007 to 6.3 in 2013.

[2] According to Medina and Schneider (2018) the shadow economy encompasses all those activities that for monetary, regulatory, or institutional reasons are hidden from official authorities.

individuals who cannot meet their medical needs—which is increasing throughout this time interval—and the corresponding percentage for rich individuals for which the percentage with unmet medical needs increased only in 2011 and 2012 and to a lesser extent than for the poor.

Here we proxy the health situation of individuals with the self-rated health (SRH) data from the ELSTAT Greek Health Interview Survey (GHIS) for 2009, 2014 and 2019. The 3 years can be considered as marking the time just before, during and after the deep financial crisis that Greece experienced. The use of self-rated health to proxy the health situation of individuals has also been followed in other studies; Tekin et al. (2018) for the USA; Heritage et al. (2008) for France and Zavras et al. (2013) for Greece to name a few.

The GHIS data show a decline between 2009 and 2014 in the percentage of individuals who perceive their general health as being very good (from 43.84% to 38.79%) and an increase in the percentage reporting they are in good (from 31.49% to 35.96%) or fair state (from 16.54% to 18.25%). Zavras *op. cit*. using cross-sectional data for 2006 and 2011, find a decline (from 71.0% to 68.8%) in the share of the population reporting being in good or very good health as opposed to being in a very poor, poor, or moderate state which is higher than the increase of 0.58 implied by the GHIS data.

Two issues arise at this point: the first pertains to the changes in the distribution of self-rated health over time. We use the expanding toolbox of polarization and inequality measures for ordinal data to find out whether the crisis led to an increase in polarization and inequality in the population with respect to its health status. The second question pertains to the variables associated with self-rated health. We use ordered probit regressions to investigate the correlation between self-rated health and variables related to economic activity (activity in the labour market, education), variables capturing lifestyle, and variables capturing health care access. The paper contributes to the discussion on the association between economic developments and well-being by documenting changes in the self-rated health of the Greek population during an and after a severe economic crisis. The polarization and inequality measures used here have not been previously documented for the case of Greece. Furthermore, the rich Greek Health Interview Surveys (GHIS) have not been used to investigate the association between self-rated health and variables pertaining to economic activity, lifestyle and health care access.

The rest of the paper is organised as follows; Sec. 2 presents information on the dataset used and a detailed descriptive analysis of the self-rated health variable using the recently proposed tool kit of measures appropriate for assessing polarization and inequality of ordinal data (Jenkins, 2020a, 2020b, 2021). Section 3 presents the analytical framework for the investigation of the determinants of self-rated health. Section 4 reports and discusses the results from regression analysis looking into the variables associated with self-rated health. Finally, Sect. 5 summarises and concludes.

2 Data and Descriptive Analysis of Self-Rated Health

2.1 The Greek Health Interview Survey (GHIS)

The Greek Health Interview Survey (GHIS) is part of the European Health Interview Survey (EHIS). The survey is conducted by the Hellenic Statistical Authority (ELSTAT) every 5 years starting 2009 and collects information, through interviews, on the health status of individuals, their use of health care, health determinants (lifestyle variables), demographics and socio-economic background variables. The survey is not longitudinal. What we have here are three separate cross sections for 2009, 2014 and 2019. The *health status* variables include a self-assessment of one's health situation, indicators for the existence or otherwise of chronic conditions, indications of accidents or injuries, functional limitations, absence from work, self-reported measures of height and weight. *Lifestyle* variables include information on smoking, drinking, and eating habits and engagement in physical activity. Information is also recorded on whether individuals have visited different medical practitioners in the previous 12 months before the interview, reasons for which they have not visited them despite need to do so and the medications they take.

The GHIS targets individuals aged at least 15 living in private households. Only one member per household is interviewed. Interviews took place in general in the last quarter of the survey year except for the 2019 survey which took place in November and December 2019 and January 2020. The sampling frame used is generated through multi-stage stratified random sampling. The final sample consists of 7171 individuals in 2009, 8223 in 2014 and 8125 in 2019. The GHIS covers urban, semi-urban and rural areas. Here, however, we focus only on individuals residing in urban areas as there has been a change between surveys in the definition of what constitutes a rural and semi-urban area. Our main variable of interest is self-rated health. Individuals assess their own general health status as being one of the following: very bad (1), bad (2), fair (neither good nor bad) (3), good (4) or very good (5). Definitions and descriptives of the GHIS variables used in this paper are presented in Sects. 2.2 and 4.

2.2 Descriptive Analysis of Self-Reported Health

To describe SRH we use the percentage of individuals belonging in each rank of the rating scale of health and the median of the distribution. This is necessary as for ordinal data, the mean is scale dependent.

Table 1 shows the cumulative proportion of individuals in each of the five categories of self-rated health (SRH) for 2009, 2014 and 2019 by gender and age group. Table 1 also presents the median of the distribution of SRH for each group.

Several observations arise from Table 1: first, in all years, for older (younger) individuals, the median takes the lowest (highest) value. Second, the median SRH

Table 1 Cumulative distribution of SRH by survey year, gender and age group

Age group	Very Bad	Bad	Fair	Good	Very good	Median
Men-2009						
All ages	1.98	5.48	16.81	48.12	100.00	5.00
15–19	3.62	6.47	6.91	24.78	100.00	5.00
20–64	1.00	2.57	10.54	42.78	100.00	5.00
64+	5.46	17.69	49.94	83.82	100.00	4.00
Men-2014						
All ages	1.34	4.61	18.02	54.16	100.00	4.00
15–19	0.00	0.00	3.08	14.19	100.00	5.00
20–64	1.01	2.67	11.27	48.28	100.00	4.00
64+	3.00	12.68	45.76	87.24	100.00	4.00
Men-2019						
All ages	0.84	4.25	15.62	48.76	100.00	5.00
15–19	0.00	0.00	1.39	15.98	100.00	5.00
20–64	0.60	2.49	9.94	41.83	100.00	5.00
64+	1.82	11.24	39.62	82.93	100.00	4.00
Women-2009						
All ages	2.34	8.54	27.17	59.28	100.00	5.00
15–19	0.00	0.00	1.14	34.27	100.00	5.00
20–64	1.16	4.21	18.78	52.86	100.00	4.00
64+	7.21	25.73	63.61	88.67	100.00	3.00
Women-2014						
All ages	1.67	6.46	25.39	63.62	100.00	4.00
15–19	0.00	0.00	2.69	18.79	100.00	5.00
20–64	0.65	2.55	15.91	57.58	100.00	4.00
64+	5.09	19.47	59.16	92.70	100.00	3.00
Women-2019						
All ages	1.36	5.51	21.51	57.32	100.00	5.00
15–19	2.42	0.00	3.69	15.75	100.00	5.00
20–64	0.65	2.71	13.09	49.85	100.00	5.00
64+	3.17	13.99	49.74	89.35	100.00	4.00

Source: Own calculations using weighted GHIS data

for younger individuals has not changed between the three survey years. Third, in 2019 for most age groups of both genders there is an improvement in SRH compared to 2014—as evidenced by the median and the rise (decline) in the percentage of individuals reporting very good (bad) health. Fourth, men over 20 report being in better health than women of the same age. Fifth, between 2009 and 2014 there is a decline in the median SRH for men between 20 and 64. Sixth, between 2009 and 2014 there appears to be a decrease in the percentage of men and women over 20 reporting being in one of the states in the extremes of the distribution. Seventh, between 2009 and 2014 there appears to be an increase in the percentage of young men and women reporting being in very good health and a decline in those reporting being in good health.

The last two observations suggest that there is some change in polarization between 2009 and 2014. We thus turn to indices of polarization and inequality to get a more precise measurement of the changes in the distribution of self-rated health. For the rest of the paper, we focus on two age groups: 20–64 and over 64 as the distribution for the 15–19-year-olds almost degenerates.

Polarization is defined as a situation in which intra-group homogeneity is coupled with inter-group heterogeneity (Esteban & Ray, 1994). Polarization and inequality do not coincide. As an example, consider the case of a uniform distribution: this is a very unequal distribution, but it is not polarized. Following Jenkins (2020b), three "families" of polarization measures can be distinguished: the Allison-Foster (A-F) index (2004); the Abul Naga and Yalcin (ANY(a,b)) indices (2008), and the Apouey (P(a)) (2007) indices.

Table 2 reports four indices of SRH polarization for men and women aged 20–64 and over 64 in the three survey years. The indices presented are the A-F index, the ANY(2,1) and ANY(1,2) indices and the P(2) index. Indices have been estimated in STATA17.0 using the `ineqord` command written and documented in Jenkins

Table 2 SRH polarization by survey year, gender and age group

Men-20–64			
	2009	**2014**	**2019**
A-F	1.138 (0.070)	1.265 (0.045)	1.097 (0.044)
P2(2)	0.374 (0.018)	0.386 (0.013)	0.363 (0.012)
ANY(2,1)	0.195 (0.021)	0.247 (0.058)	0.186 (0.013)
ANY(1,2)	0.284 (0.017)	0.316 (0.032)	0.274 (0.011)
Men-64+			
	2009	**2014**	**2019**
A-F	1.809 (0.108)	1.518 (0.065)	1.415 (0.063)
P2(2)	0.591 (0.029)	0.496 (0.019)	0.504 (0.017)
ANY(2,1)	0.362 (0.064)	0.291 (0.059)	0.275 (0.017)
ANY(1,2)	0.464 (0.038)	0.382 (0.034)	0.377 (0.016)
Women 20–64			
	2009	**2014**	**2019**
A-F	1.426 (0.042)	1.231 (0.031)	1.326 (0.036)
P2(2)	0.453 (0.014)	0.409 (0.009)	0.400 (0.010)
ANY(2,1)	0.407 (0.033)	0.360 (0.011)	0.266 (0.099)
ANY(1,2)	0.428 (0.018)	0.382 (0.008)	0.332 (0.051)
Women-64+			
	2009	**2014**	**2019**
A-F	1.582 (0.076)	1.448 (0.055)	1.557 (0.047)
P2(2)	0.582 (0.022)	0.518 (0.017)	0.500 (0.014)
ANY(2,1)	0.351 (0.023)	0.342 (0.016)	0.416 (0.078)
ANY(1,2)	0.444 (0.021)	0.412 (0.014)	0.450 (0.043)

Source: Estimates using the `ineqord` command in STATA 17.0 using weighted GHIS data. Bootstrapped standard errors in parentheses, these are produced following the procedure described in Jenkins (2020b)

(2020b). These indices can be compared only across distributions with the same medians. The A-F index is the difference between the average rating of those who select a rating above the median from the average rating for respondents with ratings below the median. The A-F measure is not scale-independent.

The second family of indices are the Abul Naga and Yalcin (2008) indices, known as ANY(a,b), where a and b are weights given to the two halves of the distribution. ANY(a,b) is the weighted difference between the cumulative percentage of individuals below the median and the cumulative percentage in the distribution above the median. The ANY(2,1) index gives greater weight to the distribution above the median compared to the distribution below the median. Reversely, the ANY(1,2) index gives greater weight to the lower part of the distribution compared to the upper part. The ANY indices are not scale-dependent and take values between 0 and 1. They take the value 0 when all individuals have selected the same rating and the value 1 when half of the population is in the leftmost category and the other half in the rightmost category.

The P2(2) index shows the dispersion in a variable compared to the maximal possible dispersion, is the same as the Blair and Lacy (2000) $1 - I2$ index and measures the dispersion of the distribution as a percentage of the maximum possible dispersion.

Given the restrictions in the comparisons of the above measures across distributions the following comparisons can be made:

(a) For men aged 20–64 between 2009 and 2019, point estimates show a decline in SRH polarization but differences are not statistically significant.
(b) For men over 64 the comparison between 2009, 2014 and 2019 shows a decline in SRH polarization but again differences are not statistically significant.
(c) For women 20–64 the comparison between 2009 and 2014 shows a decline in SRH polarization with the change in the A-F and the P2(2) (*alias* Blair and Lacy) being statistically significant.
(d) A comparison between 2009 and 2014 of the SRH distribution for women over 64 shows again a decline in polarization, as shown by the point estimates, but differences are not statistically significant.
(e) A comparison between men and women 20 to 64 of the 2014 SRH distribution shows that differences are not statistically significant.
(f) A comparison between men and women over 64 of the 2019 SRH distribution shows that differences are not statistically significant.

The following main observations thus arise from the inspection of polarization measures: first, there appears to be no increase in polarization over time; second, there is a decline between 2009 and 2014 of SRH polarization for women 20 to 64; and third, differences between genders in polarization do not appear to be statistically significant.

Turning next to inequality measures we report the Cowell-Flachaire (2017) and Jenkins (2020b) measures for inequality for ordinal data. Table 3 reports 2 indices of SRH inequality for men and women aged 20–64 and over 64 in the three survey years. Indices have been estimated in STATA17.0 using the `ineqord` command

Table 3 SRH inequality by survey year, gender and age group

Men-20–64			
	2009	**2014**	**2019**
I(0)	0.557 (0.012)	0.564 (0.011)	0.550 (0.009)
Jd	0.454 (0.009)	0.462 (0.006)	0.449 (0.006)
Men-64+			
	2009	**2014**	**2019**
I(0)	0.658 (0.012)	0.617 (0.011)	0.625 (0.010)
Jd	0.531 (0.010)	0.501 (0.007)	0.506 (0.007)
Women 20–64			
	2009	**2014**	**2019**
I(0)	0.609 (0.008)	0.621 (0.009)	0.574 (0.007)
Jd	0.495 (0.005)	0.506 (0.007)	0.471 (0.004)
Women-64+			
	2009	**2014**	**2019**
I(0)	0.639 (0.009)	0.621 (0.009)	0.639 (0.009)
Jd	0.523 (0.008)	0.506 (0.007)	0.523 (0.008)

Source: Estimates using the `ineqord` command in STATA 17.0 using weighted GHIS data. Bootstrapped standard errors in parentheses, these are produced following the procedure described in Jenkins (2020b)

written and documented in Jenkins (2020b). These indices do not require that medians of different distributions remain the same thus more comparisons than in the case of the polarization measures can be made. The two indices reported are the I(0) peer-inclusive downward looking measure of Cowell-Flachaire and the downward-looking status J measure by Jenkins. The Cowell-Flachaire indices are calculated summing the gaps between the position of an individual in the distribution under study, the individual's status, and an appropriate common reference value. According to the weight placed on different positions in the distribution, different indices are produced. We here report a case with most weight on lower status positions in the distribution. The J measure of inequality is the equivalent of the Gini coefficient for ordinal data.

The following main observations arise from the inspection of the SRH inequality measures: first, for both men and women aged 20–64 there is an increase in SRH inequality between 2009 and 2014 but the change is not statistically significant; second, for both men and women aged 20–64 SRH inequality is lower in 2019 compared to 2009 and for women the change is statistically significant. Third, for both men and women over 64 we note a decline in inequality between 2009 and 2014 and an increase between 2014 and 2019 but these differences are not statistically significant.

3 Analytical Framework for the Investigation of the Variables Associated with Self-Rated Health

Self-rated health has the advantage of summarizing in a single index a subjective assessment of one's health status. This is its main difference from the objective evaluation by a professional physician. A physician's assessment could, for example, either ignore aspects related to emotional health or could, based on available medical measurements, predict future medical issues that are not evident to the individual. Nevertheless, there is literature which suggests that for older individuals SRH can predict mortality (Wuorela et al., 2020). Furthermore, in instances in which the SRH measure takes on a higher value than the physician's assessment, the more optimistic outlook of the SRH appears to be associated with lower mortality. When, on the other hand, the SRH measure is worse than the physician's assessment, mortality is higher (DeSalvo & Muntner, 2011).

Determinants of self-rated health therefore include the same variables as objective health measures: demographic variables (age, gender, marital status, children in the household); lifestyle variables (smoking, drinking, healthy eating, physical activity, socializing); variables pertaining to the socio-economic status of individuals (education, income, region of residence); health care variables.

Younger individuals, as expected, report systematically better health status. We know from the existing literature that *ceteris paribus* women report lower SRH than men. Individuals in a *partnership* have someone to care for them and this could contribute to better health status compared to individuals without a partner. Parents of *young children* might be in a good health status because, apart from their own young age, activities with their children keep them youthful.

The importance of *lifestyle* in shaping the health status of individuals cannot be overemphasised. The quantity, quality and composition of food consumed, the use of tobacco, alcohol consumption, the extent to which a sedentary life is being pursued and the frequency of socializing all can have an impact on the health status of individuals both actual and perceived. There is a potential endogeneity issue here as those in poor health might be less likely to smoke, consume alcohol or socialize. As a result, we might observe those smoking, drinking, or socializing less being in a worse health condition. Ideally, one would have an exogenous variable predicting lifestyle habits. This, however, is not unfortunately the case with the GHIS dataset.

Most publicly funded *health care* systems have screening measures to prevent diseases. Timely diagnosis of a health issue can lessen the burden of disease for the patient. Financial difficulties may prevent individuals from visiting doctors despite the need to do so thus making the medical issue worse. The absence of any contemporaneous association between access to medical services and SRH does not necessarily imply the two are uncorrelated as the impact might become evident with a lag.

More *educated* individuals have better health as they have information on the importance of lifestyle on health, they are in jobs with fewer occupational hazards and with higher income. Higher income permits access to more qualified medical

practitioners, more frequent visits to them and better living conditions (e.g., better heated homes, vacations, better quality food etc).

Labour market activity can have an additional impact on health over that of income as individuals have a need of purpose. The absence of labour market activity, conditional on income, is mostly evident through mental health. The issue of whether health is procyclical has not been settled in the literature (see, for example, Ruhm, 2000 for a procyclical view and Tekin *op. cit*. for an acyclical view). The arguments for procyclical health suggest that displaced individuals suffer stress which impacts their health (mental and overall) negatively, do not have enough resources to cover medical fees or insurance premiums, do not eat healthily. The arguments for countercyclical health hinge mainly on the opportunity cost of time; in a boom, time for health-related activities (e.g., visits to the doctor, physical activity etc) is scarcer. In addition, as income increases individuals indulge more easily in consuming expensive unhealthy products (e.g., tobacco, alcohol etc).

The *region of residence* can impact on the health status of individuals through a multitude of mechanisms; environmental factors, proximity to amenities, crime rate and economic activity are but a few.

Finally, objectively verified medical conditions (e.g., the existence of a long-standing medical issue) and anthropometric measurements (e.g., body mass index (BMI)) are likely to be associated with SRH.

By conditioning on lifestyle variables (physical activity, smoking, alcohol consumption), access to health care, medical conditions, and measurements (long-standing health issue, bmi), as we do in the next section, we can isolate the association with economic activity variables.

4 Empirical Analysis of Self-Rated Health

This section presents and discusses the regression results from an ordered probit model of the association between the SRH variable, and the variables presented above in the framework discussion. The discussion is organized along two lines. First, on assessing whether the associations between the variables presented in the framework section and SRH are statistically significant. Second, given the actual changes in these variables we discuss their potential association with the observed changes in actual SRH.

The coefficients of interest are in the β vector of the following model:

$$\Pr\left(SRH = m|x_i\right) = F\left(\tau_m - x\beta\right) - F\left(\tau_{m-1} - x\beta\right) \tag{1}$$

where: m is each ordinal category of the self-rated health variable and takes values from 1 (Very bad) to 5 (Very good); τ are the cut-off points[3] between ordinal categories; F is the normal cumulative distribution function.

[3] We have tested, for each ordered probit regression estimated that the cut-off points are statistically different from each other.

The x vector contains the following variables: *age* which enters non-linearly through dummy variables for each of the 9 (4) 5-year age intervals in the regressions for the 20–64 (64+) regressions. The 40–44 age group (80+) is the reference group in the regressions for the 20–64-year-old (64+). *marital status* is a dummy variable indicating the individual is currently in a marriage or registered partnership (married is the reference group); *children* represents the number of children 13 years old or younger in the household; *region of residence* are dummy variables for each of the 4 NUTS-2 level regions Greece is divided into: Attica Region (reference value), Aegean Islands & Crete; Northern Greece and Central Greece; *highest education level* dummy variables for each of the 4 education levels used: less than upper high school, upper high school (reference group), post-secondary non-tertiary education and tertiary education; *long-term health issue* a dummy variable indicating the existence of a long-standing health problem (presence of a long-standing health issue is the reference value); *smoker* a dummy indicating whether the individual is a current smoker (non-smokers are the reference value); *alcohol* five dummy variables for each of the following distinct frequencies with which individuals consume alcohol never (the reference group), monthly or less, on 1–2 days a week or less, on between 3–6 days per week, everyday; *no walk* is a dummy variable indicating that the individual does not walk even for 10 min going between places during the week, the reference group are individuals who walk for at least 10 min at least once a week. *Healthy Eat* five dummy variables representing the frequency with which individuals eat fruits or vegetables: once a day or more often (the reference group), at least 4 times a week, at least once a week, less than once a week, never; *economic activity* five dummy variables for each of the following possible activities of the individual: employed (the reference group), unemployed, in education, retired, inactive; *social support* dummy variables for 4 distinct levels of social support depending on the number of close individuals available to rely on in case of serious personal problems: none, one or two (the reference group), three to five, six or more. We also include the body mass index (*BMI*)—body weight in kg over height in metres squared—calculated based on the information provided by the individual. For two of the survey years (2014 and 2019) we have information on whether individuals could not afford *access to health care* if needed. In those 2 years we use three mutually exclusive dummy variables for each of the following: whether the individual could not afford access to health care in the past 12 months, whether the individual did not seek medical treatment despite being able to afford such treatment and a dummy indicating the individual did not seek medical treatment because she did not need to.

The role of *income* in health status cannot be overemphasised. Unfortunately, however, in the data available to us, we only have information on the quintile the individual's equivalised household income belongs to. This variable is significant in the regressions and with the expected sign but once it is included, the education and activity status variables are no longer significant. As the GHIS is not longitudinal and we are more interested in variables that have changed over time—quintiles do not—we have not included equivalised household income in the regression results reported.

Tables 4 and 5 present the means of the variables used in the analysis. Table 4 reports the means of the demographics and productive features (highest education level achieved, economic activity) and Table 5 the means of lifestyle-related and access to health care variables.

Table 4 makes clear that age groups differ significantly over their activity status, that educational attainment has improved considerably over time, and thus the over 64 have lower achievements, and that women have considerably lower employment rates. The inspection of the figures reported in Table 5 reveals: first that women have a healthier lifestyle than men (less smoking, less alcohol, more frequent fruit, and vegetable consumption); second, that the elderly follow a healthier lifestyle than the younger; third, that the elderly have fewer individuals to rely on than the younger, and fourth, that a significant share of individuals could not afford health care.

The marginal effects of the variables in the estimation of the ordered probit regression for the first (Very bad) and the last category (Very good) are reported in Tables 6 and 7 for the regressions using all three survey years and for the regressions using the latter 2 years respectively. The need for both sets of regressions arises from the absence of the access to health care variable in 2009.

Based on the ordered probit estimates, Fig. 1 shows the probability of being in very bad and very good health at different ages for those between 20 and 64. The figure suggests that the probability of having very good (very bad) SRH decreases (increases with age) especially after the age of 34. The probabilities of being in a very good and very bad state is higher for men than for women. The deterioration in the probability of men being in either very good or very bad state is steeper for men than for women. A similar picture emerges for those over 64 although not reported separately here.

Marital status is not statistically significant in the regression for men for both those 20–64 and for those over 64. For women, 20–64 and 64+, not being married appears to be associated with worse SRH. The number of children younger than 13 is not correlated with SRH for men and is marginally positively associated with SRH for women. Men, 20–64 and 64+, residing in either central or northern Greece appear to enjoy higher SRH than those residing in Attica. For women 64+ there is no difference in SRH across regions of residence. For women 20–64, however, those residing in central Greece seem to enjoy better SRH than those in Attica. The education dummies show that for men and women, 20–64 and 64+, with less than upper high school leaving certificate the probability of having very bad SRH is higher than for those with an upper high school leaving certificate. The opposite is true for those having completed tertiary education although for women 20–64 we find the result is not statistically significant.

Turning to the economic activity variable Table 8 shows the probability of reporting very bad and very good SRH depending on the activity followed. The results show that unemployment is associated with a lower (by around six percentage points for both men and women) probability of being in very good health compared to being in employment. Furthermore, the results indicate that inactivity is very bad for men as the probability of being in a very good health state for inactive men is

Table 4 Means of demographic and productivity-related variables used in the regression

Variable	Definition	Mean			
		Men 20–64 (N = 3348)	Women 20–64 (N = 4261)	Men 64+ (N = 1367)	Women 64+ (N = 2095)
child013	# children 0–13 years in household	0.409	0.482	0.0174	0.0143
Age 20–24	Aged 20 to 24	0.106	0.099	–	–
Age 25–29	Aged 25 to 29	0.102	0.085	–	–
Age 30–34	Aged 30 to 34	0.120	0.120	–	–
Age 35–39	Aged 35 to 39	0.120	0.115	–	–
Age 40–44	Aged 40 to 44	0.137	0.133	–	–
Age 45–49	Aged 45 to 49	0.116	0.113	–	–
Age 50–54	Aged 50 to 54	0.113	0.123	–	–
Age 55–59	Aged 55 to 59	0.090	0.112	–	–
Age 60–64	Aged 60 to 64	0.095	0.101	–	–
Age 65–69	Aged 65 to 69	–	–	0.312	0.300
Age 70–74	Aged 70 to 74	–	–	0.252	0.230
Age 75–79	Aged 75 to 79	–	–	0.204	0.205
Aged 80+	Aged 80 +	–	–	0.233	0.264
Married	Currently married	0.568	0.662	0.833	0.465
Attica	Resident in Attica	0.503	0.476	0.519	0.519
Aegean, Crete	Resident Aegean isld./ Crete	0.077	0.079	0.061	0.062
North	Resident in Northern Greece	0.271	0.284	0.277	0.278
Central	Resident in Central Greece	0.149	0.161	0.142	0.141
Educ-1	Less than high school	0.177	0.169	0.474	0.643
Educ-2	Upper-high school	0.378	0.357	0.227	0.219
Educ-3	Post-secondary non-tertiary	0.074	0.090	0.024	0.025
Educ-4	Tertiary education	0.371	0.384	0.275	0.113
Employed	Self-defined activity: employed	0.672	0.455	0.042	0.018
Unemployed	Self-defined activity: unemployed	0.149	0.185	0.013	0.008
In education	Self-defined activity: in education	0.070	0.068	0.000	0.001
Retired	Self-defined activity status: retired	0.082	0.090	0.919	0.635
Inactive	Self-defined activity status: inactive	0.027	0.203	0.025	0.338
Year 2009	2009 sample	0.210	0.201	0.181	0.183
Year 2014	2014 sample	0.396	0.394	0.399	0.386
Year 2019	2019 sample	0.395	0.405	0.420	0.431

Source: Own calculations using weighted GHIS data

Table 5 Means of lifestyle-related and access to health care variables used in the regression

Variable	Definition	Mean			
		Men 20–64	Women 20–64	Men 64+	Women 64+
		(N = 3348)	(N = 4261)	(N = 1367)	(N = 2095)
No LT health issue	No long-standing health problem	0.711	0.618	0.270	0.183
Smoker	Currently a daily or occasional smoker	0.454	0.360	0.217	0.138
No alcohol	No alcoholic drink in last 12 months	0.149	0.162	0.197	0.587
Monthly alcohol	Alcoholic drink in last 12 months 1 pm or less frequently	0.190	0.308	0.289	0.219
Bi-weekly alcohol	Alcoholic drink in last 12 months 1–2/pw or less frequently	0.452	0.332	0.087	0.130
Thrice alcohol	Alcoholic drink in last 12 months 3–6/pw or less frequently	0.129	0.056	0.167	0.023
Daily alcohol	Drank an alcoholic drink in last 12 months daily	0.079	0.021	0.194	0.041
No walk	Never in a typical week does the individual walk for at least 10 min to get to and from places	0.129	0.121	0.194	0.304
Health eat 1	Consumption of fruit/ vegetables at least once a day	0.468	0.569	0.644	0.610
Health eat 2	Consumption of fruit/ vegetables at least 4 times pw	0.183	0.159	0.156	0.149
Health eat 3	Consumption of fruit/ vegetables at least once pw	0.245	0.192	0.141	0.139
Health eat 4	Consumption of fruit/ vegetables <1 pw	0.079	0.061	0.046	0.049
Health eat 5	Never consume fruit/vegetables	0.026	0.019	0.014	0.017
Social support 0	No close people to count on	0.039	0.033	0.053	0.036
Social support 1	1–2 close people to count on	0.468	0.453	0.577	0.580
Social support 2	3–5 close people to count on	0.400	0.432	0.364	0.334
Social support 3	>5 close people to count on	0.094	0.083	0.059	0.050
Afford HC	Could afford health care in past 12 months	0.064	0.103	0.085	0.138
Can't afford HC	Couldn't afford health care in past 12 months	0.565	0.636	0.731	0.719
No need HC	No need for health care in past 12 months	0.370	0.263	0.184	0.143
BMI	Body mass index	26.734	24.734	27.151	27.103

NB: pm = per month, pw = per week

Source: Own calculations using weighted GHIS data. The means of all variables, except for the access to health care, are averages for all three survey years

Table 6 Marginal effects from regressions for 2009, 2014 and 2019 (no variable for access to health care)

	20–64				64+			
	Men	Men	Women	Women	Men	Men	Women	Women
	Very bad	Very good	Very bad	Very good	Very bad	Very good	Very bad	Very good
Educ-1	0.00254**	−0.0490**	0.00297***	−0.0636***	0.0202***	−0.0650***	0.0130**	−0.0214**
	(0.00127)	(0.0230)	(0.00100)	(0.0193)	(0.00541)	(0.0151)	(0.00550)	(0.00907)
Educ-3	−0.00207	0.0400	0.000946	−0.0203	0.00627	−0.0202	−0.0367**	0.0602**
	(0.00173)	(0.0333)	(0.00119)	(0.0252)	(0.0118)	(0.0379)	(0.0167)	(0.0273)
Educ-4	−0.00245**	0.0475**	−0.000935	0.0200	−0.0117**	0.0378**	−0.0122	0.0199
	(0.00104)	(0.0187)	(0.000797)	(0.0165)	(0.00550)	(0.0175)	(0.00836)	(0.0135)
Unemployed	0.00341***	−0.0659***	0.00242**	−0.0519***	0.0333	−0.107*	0.0544**	−0.0891**
	(0.00125)	(0.0223)	(0.000948)	(0.0181)	(0.0209)	(0.0644)	(0.0276)	(0.0448)
In education	−0.000342	0.00661	−0.00241	0.0516	−0.265***	0.851***	−0.0199	0.0326
	(0.00278)	(0.0538)	(0.00222)	(0.0468)	(0.0382)	(0.0786)	(0.0263)	(0.0429)
Retired	0.00186	−0.0360	0.00236*	−0.0505**	0.0101	−0.0324	0.0115	−0.0188
	(0.00156)	(0.0300)	(0.00127)	(0.0243)	(0.0117)	(0.0374)	(0.0242)	(0.0396)
Inactive	0.0203***	−0.392***	0.00306***	−0.0657***	0.0397**	−0.128**	0.0130	−0.0214
	(0.00509)	(0.0621)	(0.00103)	(0.0187)	(0.0185)	(0.0577)	(0.0243)	(0.0397)
No LT health issue	−0.0160***	0.309***	−0.0146***	0.312***	−0.0615***	0.198***	−0.0901***	0.148***
	(0.00267)	(0.0150)	(0.00259)	(0.0118)	(0.00892)	(0.0171)	(0.00975)	(0.0114)
Smoker	0.00279***	−0.0540***	0.00185***	−0.0397***	−0.00566	0.0182	−0.00437	0.00716
	(0.000947)	(0.0163)	(0.000715)	(0.0137)	(0.00469)	(0.0150)	(0.00646)	(0.0106)
Monthly alcohol	−0.00337**	0.0651**	−0.00170**	0.0365**	−0.00844	0.0271	−0.0230***	0.0377***
	(0.00143)	(0.0267)	(0.000849)	(0.0165)	(0.00622)	(0.0199)	(0.00564)	(0.00885)
Bi-weekly alcohol	−0.00504***	0.0974***	−0.00121	0.0259	−0.0124**	0.0398**	−0.0207***	0.0339***
	(0.00144)	(0.0236)	(0.000846)	(0.0173)	(0.00588)	(0.0184)	(0.00698)	(0.0110)
Thrice alcohol	−0.00473***	0.0915***	−0.00408**	0.0874***	−0.0132*	0.0425*	−0.0275**	0.0451**
	(0.00168)	(0.0291)	(0.00163)	(0.0308)	(0.00778)	(0.0244)	(0.0133)	(0.0214)
Daily alcohol	−0.00513***	0.0992***	−0.00163	0.0349	−0.0213***	0.0686***	−0.0486***	0.0797***

(continued)

Table 6 (continued)

	20–64				64+			
	Men	Men	Women	Women	Men	Men	Women	Women
	Very bad	Very good	Very bad	Very good	Very bad	Very good	Very bad	Very good
	(0.00191)	(0.0335)	(0.00193)	(0.0409)	(0.00683)	(0.0205)	(0.0143)	(0.0235)
No walk	0.00251**	−0.0486**	0.00421***	−0.0903***	0.0364***	−0.117***	0.0465***	−0.0762***
	(0.00126)	(0.0229)	(0.00115)	(0.0192)	(0.00706)	(0.0174)	(0.00611)	(0.00897)
Health eat 2	0.000904	−0.0175	−0.000593	0.0127	0.00988*	−0.0318*	0.0199***	−0.0327***
	(0.00106)	(0.0203)	(0.000837)	(0.0177)	(0.00536)	(0.0170)	(0.00585)	(0.00949)
Health eat 3	0.00145	−0.0281	0.00282***	−0.0605***	0.00949	−0.0305	0.0189***	−0.0310***
	(0.00107)	(0.0203)	(0.000946)	(0.0174)	(0.00624)	(0.0197)	(0.00589)	(0.00969)
Health eat 4	0.00210	−0.0405	0.00464***	−0.0994***	0.0166*	−0.0535*	0.0255***	−0.0417***
	(0.00143)	(0.0275)	(0.00146)	(0.0263)	(0.00913)	(0.0286)	(0.00836)	(0.0139)
Health eat 5	0.00616**	−0.119**	0.00277	−0.0594	0.00950	−0.0306	0.0118	−0.0193
	(0.00292)	(0.0547)	(0.00252)	(0.0537)	(0.0179)	(0.0577)	(0.0136)	(0.0224)
Social support 0	0.000839	−0.0162	0.00273*	−0.0585*	−0.00695	0.0224	0.0167	−0.0273
	(0.00181)	(0.0349)	(0.00154)	(0.0323)	(0.00873)	(0.0279)	(0.0104)	(0.0171)
Social support 2	0.000316	−0.00610	−0.00127*	0.0272**	−0.00813*	0.0262*	−0.00133	0.00218
	(0.000890)	(0.0172)	(0.000675)	(0.0137)	(0.00435)	(0.0140)	(0.00464)	(0.00762)
Social support 3	−0.00201	0.0388	−0.00110	0.0236	−0.0188**	0.0605**	0.00171	−0.00280
	(0.00147)	(0.0279)	(0.00126)	(0.0266)	(0.00928)	(0.0295)	(0.0103)	(0.0168)
BMI	0.000333***	−0.00644***	0.000331***	−0.00709***	0.000657	−0.00211	0.00154***	−0.00253***
	(0.000115)	(0.00202)	(7.74e-05)	(0.00136)	(0.000479)	(0.00153)	(0.000500)	(0.000800)
Pseudo-R^2	0.2091		0.1943		0.1577		0.1611	
Observations	3294	3294	4211	4211	1336	1336	2035	2035
Standard errors in parentheses								
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$								

NB: Regressions also include age categories, marital status, number of children aged 0–13 in the household, and region of residence
Source: Own estimates based on coefficients from the ordered probit regressions

Table 7 Marginal effects from regressions for 2014 and 2019 (including variable for access to health care)

	20–64				**64+**			
	Men	Men	Women	Women	Men	Men	Women	Women
	Very bad	*Very good*	*Very bad*	*Very good*	*Very bad*	*Very good*	*Very bad*	*Very good*
Educ-1	0.00265**	−0.0591**	0.00217**	−0.0512**	0.0125***	−0.0481***	0.0101*	−0.0186*
	(0.00125)	(0.0248)	(0.00101)	(0.0219)	(0.00456)	(0.0157)	(0.00531)	(0.00982)
Educ-3	−0.00143	0.0319	0.000788	−0.0186	0.00390	−0.0150	−0.0350**	0.0643**
	(0.00167)	(0.0373)	(0.00113)	(0.0264)	(0.0112)	(0.0429)	(0.0169)	(0.0308)
Educ-4	−0.00270***	0.0601***	−0.000681	0.0160	−0.0112**	0.0429**	−0.0151*	0.0277*
	(0.00104)	(0.0200)	(0.000786)	(0.0181)	(0.00510)	(0.0189)	(0.00810)	(0.0144)
Unemployed	0.00234**	−0.0521**	0.00256***	−0.0604***	0.0193	−0.0743	0.0769***	−0.141***
	(0.00116)	(0.0243)	(0.000964)	(0.0194)	(0.0153)	(0.0581)	(0.0240)	(0.0426)
In education	−0.00126	0.0281	−0.00296	0.0698	–	–	0.0260	−0.0478
	(0.00262)	(0.0579)	(0.00233)	(0.0531)	–	–	(0.0201)	(0.0369)
Retired	0.00116	−0.0258	0.00189	−0.0444*	0.0113	−0.0435	0.0490**	−0.0899***
	(0.00137)	(0.0303)	(0.00117)	(0.0256)	(0.0105)	(0.0401)	(0.0195)	(0.0346)
Inactive	0.0193***	−0.429***	0.00335***	−0.0790***	0.0375**	−0.144**	0.0501**	−0.0919***
	(0.00517)	(0.0628)	(0.00111)	(0.0210)	(0.0169)	(0.0626)	(0.0197)	(0.0348)
No LT health issue	−0.0128***	0.285***	−0.0124***	0.291***	−0.0466***	0.179***	−0.0731***	0.134***
	(0.00245)	(0.0165)	(0.00245)	(0.0130)	(0.00806)	(0.0172)	(0.00935)	(0.0115)
Smoker	0.00259***	−0.0577***	0.00155**	−0.0365**	−0.00497	0.0191	−0.00200	0.00367
	(0.000904)	(0.0175)	(0.000718)	(0.0150)	(0.00420)	(0.0161)	(0.00645)	(0.0118)
Monthly alcohol	−0.00368***	0.0820***	−0.000525	0.0124	−0.00919*	0.0353*	−0.0167***	0.0307***
	(0.00137)	(0.0280)	(0.000787)	(0.0182)	(0.00536)	(0.0206)	(0.00527)	(0.00935)
Bi-weekly alcohol	−0.00432***	0.0961***	−7.51e-05	0.00177	−0.0138***	0.0533***	−0.0153**	0.0281**
	(0.00131)	(0.0248)	(0.000813)	(0.0191)	(0.00536)	(0.0196)	(0.00652)	(0.0115)
Thrice alcohol	−0.00510***	0.113***	−0.00263*	0.0620*	−0.0169**	0.0649***	−0.0238*	0.0436*

(continued)

Table 7 (continued)

	20–64				**64+**			
	Men	Men	Women	Women	Men	Men	Women	Women
	Very bad	*Very good*	*Very bad*	*Very good*	*Very bad*	*Very good*	*Very bad*	*Very good*
	(0.00159)	(0.0298)	(0.00150)	(0.0330)	(0.00688)	(0.0246)	(0.0128)	(0.0230)
Daily alcohol	−0.00418**	0.0930**	−0.000548	0.0129	−0.0253***	0.0974***	−0.0421***	0.0773***
	(0.00181)	(0.0372)	(0.00191)	(0.0449)	(0.00655)	(0.0213)	(0.0141)	(0.0256)
No walk	0.00200*	−0.0446*	0.00427***	−0.100***	0.0277***	−0.107***	0.0459***	−0.0842***
	(0.00115)	(0.0238)	(0.00126)	(0.0214)	(0.00602)	(0.0180)	(0.00657)	(0.0100)
Health eat 2	5.28e-05	−0.00118	−0.000475	0.0112	0.00758	−0.0292	0.0132**	−0.0242**
	(0.000999)	(0.0222)	(0.000818)	(0.0191)	(0.00478)	(0.0181)	(0.00540)	(0.00991)
Health eat 3	0.00100	−0.0223	0.00252***	−0.0593***	0.00560	−0.0215	0.0154***	−0.0283***
	(0.000939)	(0.0208)	(0.000929)	(0.0188)	(0.00546)	(0.0207)	(0.00544)	(0.0101)
Health eat 4	0.00148	−0.0329	0.00334**	−0.0787**	0.0140*	−0.0539*	0.0231***	−0.0424***
	(0.00140)	(0.0311)	(0.00149)	(0.0311)	(0.00783)	(0.0290)	(0.00829)	(0.0155)
Health eat 5	0.00414*	−0.0922*	0.00237	−0.0558	−0.00300	0.0115	0.0173	−0.0318
	(0.00248)	(0.0544)	(0.00280)	(0.0656)	(0.0161)	(0.0617)	(0.0134)	(0.0248)
Social support 0	0.000688	−0.0153	0.00272*	−0.0640*	−0.00129	0.00497	0.00889	−0.0163
	(0.00171)	(0.0381)	(0.00154)	(0.0353)	(0.00796)	(0.0306)	(0.0104)	(0.0191)
Social support 2	0.000760	−0.0169	−0.000736	0.0173	−0.00826**	0.0318**	−0.00145	0.00266
	(0.000835)	(0.0183)	(0.000652)	(0.0148)	(0.00389)	(0.0147)	(0.00441)	(0.00811)
Social support 3	−0.00203	0.0453	−0.000798	0.0188	−0.00303	0.0117	−0.00897	0.0165
	(0.00142)	(0.0308)	(0.00131)	(0.0306)	(0.00767)	(0.0295)	(0.0104)	(0.0192)
BMI	0.000306***	−0.00680***	0.000301***	−0.00709***	0.000742*	−0.00286*	0.00134***	−0.00246***
	(0.000105)	(0.00203)	(7.94e-05)	(0.00150)	(0.000427)	(0.00162)	(0.000471)	(0.000842)
Afford HC	0.00580***	−0.129***	0.00414***	−0.0976***	0.0178***	−0.0684***	0.0221***	−0.0405***
	(0.00194)	(0.0361)	(0.00126)	(0.0225)	(0.00622)	(0.0231)	(0.00642)	(0.0115)

No need for HC	−0.00389***	0.0865***	−0.00178**	0.0420**	−0.00863*	0.0332*	−0.00631	0.0116
	(0.00111)	(0.0182)	(0.000819)	(0.0175)	(0.00480)	(0.0177)	(0.00561)	(0.0102)
Pseudo-R^2	0.2245		0.1973		0.1593		0.1750	
Observations	2786	2786	3485	3485	1157	1157	1690	1690
Standard errors in parentheses								
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$								

NB: Regressions also include age categories, marital status, number of children aged 0–13 in the household, and region of residence
Source: Own estimates based on coefficients from the ordered probit regressions

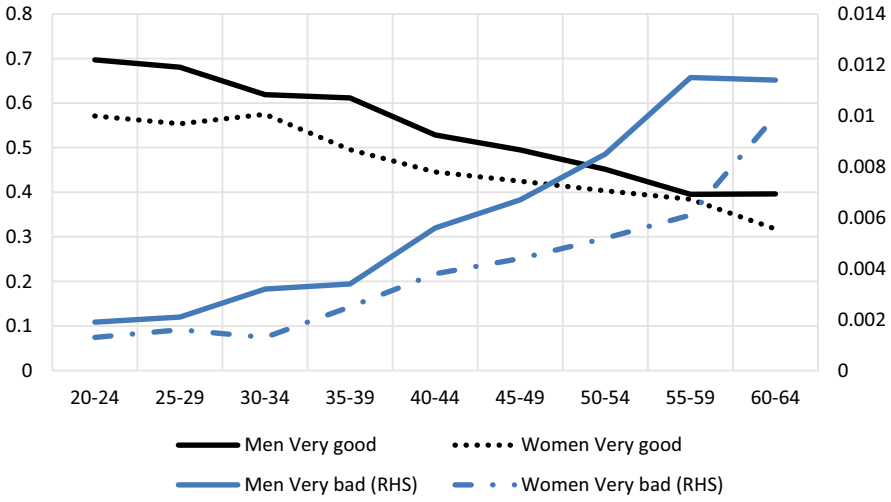


Fig. 1 Probability of SRH being very good (LHS) and very bad (RHS) by age group and gender. Source: Own calculations based on estimates from the ordered probit regressions

Table 8 Probability of very bad or very good SRH depending on economic status

	Men 20–64		Women 20–64	
	Very bad	Very good	Very bad	Very good
Employed	0.0040	0.5687	0.0043	0.4877
Unemployed	0.0067	0.5008	0.0064	0.4345
In education	0.0038	0.5754	0.0028	0.5403
Retired	0.0054	0.5319	0.0064	0.4360
Inactive	0.0524	0.1901	0.0072	0.4206

Source: Own calculations based on estimates from the ordered probit regressions for the three survey years pooled together

very low and finally, that those in education enjoy a very high SRH as they are, in general, younger.

Given the decline in the percentage of individuals who are employed between 2009 and 2014, as evidenced by Table 9, the changes in the marginal effects reported in Table 8 can explain the decline in the individuals reporting being in very good health in 2014 compared to 2009.

Absence of a long-standing health issue is associated, as expected, with a lower probability of being in very bad health and with a higher probability of being in very good health (Tables 6 and 7).

Regarding the lifestyle and access to health care variables Table 10 shows the probability of very bad or very good SRH for current smokers, individuals who drink no alcohol, individuals who walk at least 10 min in the week and for those who cannot afford health care. We do not discuss the variables capturing the extent

Table 9 Means over time of the dummies on different levels of economic activity, lifestyle and health care access variable

	Men 20–64			Women 20–64		
	2009	2014	2019	2009	2014	2019
Employed	0.7233	0.6212	0.6821	0.5069	0.3965	0.4956
Unemployed	0.0733	0.1973	0.1448	0.0915	0.2230	0.1844
Current smoker	0.5016	0.4663	0.4167	0.4429	0.3740	0.3037
Ten-minute walk pw	0.8782	0.8633	0.8740	0.8730	0.8754	0.8934
No alcohol consumption	0.1544	0.1655	0.1308	0.3218	0.3090	0.2453
Alcohol 1–2 days pw	0.4872	0.4069	0.4681	0.3135	0.3241	0.335
Can't afford health care		0.0926	0.0350		0.1495	0.0581

NB: pw = per week
Source: Own calculations using weighted GHIS data

Table 10 Probability of very bad or very good SRH depending on habits and financial position

	Men 20–64		Women 20–64	
	Very bad	Very good	Very bad	Very good
Not a current smoker	0.0073	0.5749	0.0054	0.4796
Current smoker	0.0101	0.5207	0.0073	0.4398
No alcohol consumption	0.0120	0.4708	0.0071	0.4388
Alcohol 1–2 days pw	0.0065	0.5704	0.0058	0.4649
Ten-minute walk pw	0.0080	0.5562	0.0051	0.4751
Not even 10 min walking per week	0.0107	0.5069	0.0102	0.3847
Can't afford health care	0.0146	0.3838	0.0098	0.3620
Can afford health care	0.0067	0.5187	0.0047	0.4603

NB: pw = per week
Source: Own calculations based on estimates from the ordered probit regressions

of healthy eating or social support as these are not in general statistically significant in the ordered probit regressions as can be seen in Tables 6 and 7.

The results in Table 10 suggest that, as expected, smoking is associated with a lower probability—of around five percentage points—of being in very good health for both men and women. Given that the percentage of current smokers, both men and women, declined after 2009 (see Table 9), this could perhaps explain the less than expected deterioration in SRH between 2009 and 2014 despite the severe economic downturn.

The consumption of alcohol one to 2 days per week, on the other hand, is associated with a higher probability of being in good health compared to the consumption of no alcohol. For men the higher probability is around ten percentage points. As the consumption of alcohol decreased for men between 2009 and 2014, this is associated with a decline in SRH.

Physical activity as measured by a minimum of a 10 min walk at least once a week is associated with a higher probability of being in very good health especially for women (Table 10). The percentage of individuals walking for this duration did

not change by much between 2009 and 2014 but it did increase and could thus be associated with the improvement in SRH after 2014.

Finally, being able to afford health care is associated with a large change in the probability of a very good SRH status. Men who can afford health care have a probability of 0.52 of very good SRH compared to a probability of 0.39 of those who can't afford health care. The percentage of individuals who cannot afford health care declined significantly between 2014 and 2019 and this could perhaps partly explain the improvement in SRH between the 2 years.

Reduced smoking and traffic accidents during economic crises have been recorded in other countries. These improvements do not always materialize in improved self-rated health as they are accompanied by adverse changes in, for example, eating habits and as a result self-rated health might deteriorate or remain stable and socio-economic inequalities may widen (see, for example, Sane Schepisi et al. (2021) for four Mediterranean countries; Bartoll et al. (2015) for Spain). Studies for Japan, however, where the economic crisis was more prolonged have concluded that self-rated health did not deteriorate and that inequalities in self-rated health narrowed as self-rated health of those with high income deteriorated (see, *inter alia*, Hiyoshi et al., 2013; Kondo et al., 2008).

5 Conclusion

The data on SRH in Greece suggest that health status might be procyclical; there was a deterioration between 2009 and 2014 when GDP declined substantially and an improvement between 2014 and 2019 when GDP started growing. The deterioration between 2009 and 2014, however, does not appear as significant as expected and there seems to have been no increase in polarization. A potential explanation for this subdued change is that the decline in economic activity, which is associated with worse SRH, was accompanied by a decline in smoking, which is also associated with worse SRH. Between 2014 and 2019, economic activity picked up, smoking continued on a declining trend and more individuals could afford access to health care. These developments are associated with improved SRH.

The above results have implications both for research and policy. Regarding research the findings suggest that confounders (e.g., smoking) can explain the seemingly limited association between economic activity and self-rated health. Regarding policy, the importance of lifestyle for health becomes obvious. The challenge is to maintain the healthy lifestyle when the economy picks up with the aim of improving individuals' health status.

Many of the variables investigated—lifestyle variables and economic activity indicators—are endogenous to health. Thus, to find causal effects from these to health we need to find exogenous variables affecting these that do not impact on health. This is the next step in this project.

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Part VII
Eurasian Economic Perspectives: Investment

Behavioral Intention to Participate in Crypto Investment: The Role of Exchange Reputation



Rangga Almahendra, Mohd Dimasqi Abandi Asmar, and Muhamad Nabawi

Abstract As cryptocurrencies continue to gain mainstream recognition and popularity, social science research is becoming increasingly essential in understanding the factors contributing to their rapid growth and integration into financial investment. Based on the opportunities of this phenomenon, this research will be conducted to look at the antecedents of a person's behavioral intention to invest in crypto assets. Our research will observe an individual's choice to invest in crypto assets using social exchange and planned behavior theories. In this study, a construct closely related to crypto assets is also added, namely exchange reputation. We conducted an online survey involving more than 150 crypto asset investors in Indonesia and employed structural equation modeling—partial least square (SEM-PLS). Our research concludes that behavioral intention to participate in the crypto investment depends on how much the investor's perceived positive impact influences their investment attitude. This study also demonstrates that platform reputation moderates the relationship between attitude and behavioral intention to engage in cryptocurrency investment. Finally, we discovered that the perceived negative impact does not influence the willingness to invest in crypto assets.

Keywords Investment · Crypto assets · Company reputation · Behavioral intentions · Social exchange theory · Theory of planned behavior

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1 Introduction

The introduction of Bitcoin in 2009 triggered a massive amount of debate and technological inquiry. A new form of money called cryptocurrency, which represents a digital version of money and investment opportunities, attracts people to invest, store and spend digital assets secured with cryptography (Hui et al., 2020). The growth of Bitcoin and other cryptocurrencies are attracting an increasing amount of critical examination. Several virtual platforms register and trade over 8000 cryptocurrencies due to investors' increasing interest and focus on the potential and risks of using cryptocurrencies (Boyukaslan & Ecer, 2021).

A cryptocurrency is a basic form of digital currency development because it differs from other digital currencies issued by organizations with a centralized system and stands behind fiat currencies (Lee et al., 2018). The present transaction method, which relies on intermediaries like banks, has various things that could be improved, including transparency, speed, and security concerns, which can result in higher transaction costs (Surati et al., 2021).

Cryptocurrencies are not only present to challenge existing payment methods but also promise a new economic system in the future (Seetharaman et al., 2017). The cryptocurrency industry has previously gained incredible traction and the efficiency of cryptocurrency markets are increasing over time (López-Martín et al., 2021; Phiri, 2022). Investors' great interest and attention cause crypto currency value to soar quickly compared to the existence of fiat currencies. However, a primary concern of this growth is our limited understanding of people's behavior towards crypto technology and adaptation. On one side, we have people who strongly believe in the future of cryptocurrency. In contrast, other groups remain skeptical due to unpredictable volatility, a definite weakness of cryptocurrencies (Arias-Oliva et al., 2019).

Research on cryptocurrencies is growing rapidly because many disciplines are interested in studying the phenomenon from a different point of view. Most crypto research discusses price movements, volatility, returns, crypto values, etc. (Anastasiou et al., 2021; Ahmed, 2022; Dowling, 2022); what is the determinant behind the behavioral intention toward crypto investment remains to be seen.

In this study, we focused on the behavioral attitudes of the crypto investor. The use of attitude variables here explores how investors' attitudes can affect behavioral intentions to invest in crypto investment. The precise effect of cryptocurrency adoption is a much-debated topic. One major issue in early cryptocurrency research concerned the attribute of the crypto-assets characteristics and neglecting the behavioral attribute of the crypto users.

Only a few studies have investigated the human behavior dimension of cryptocurrency adoption. Considering the complex nature of human behavior and drawing insights from both strands of literature, it makes sense to incorporate relevant personality and social factors to form an integrated model that explains why and how someone intends to invest in crypto assets (Ng et al., 2021). Our study asserts that the Theory of Planned Behavior (TPB) and Social Exchange Theory (SET) are the most popular models that could explain people's behavior toward crypto assets.

Although these two models have different assumptions and arguments, they both show predictive power that explains behavior towards something (Gifford & Nilsson, 2014). The models also show a combination of internal and external factors, interacting with each other as if they are related according to their mutual relationship.

This study aims to integrate the theory of planned behavior and the theory of social exchange into a new model, to examine the influence of personality and social factors and their interactions on a person's behavioral intention to invest in crypto assets. While personality factors directly affect behavioral intentions, social factors represent external influences that influence personality factors and behavioral intentions. Ajzen (2012) also shares a similar view, suggesting that some background or contextual factors might evoke or change attitudes, subjective norms, and perceived behavioral control, leading to the formation of intentions.

Behavioral intentions are influenced by personality and social factors, which may be interrelated (Hsu et al., 2010). The results of this study confirm the proposed association that expectations directly impact motivation; motivation directly affects attitude; expectations directly affect attitudes; motivation mediates the relationship between expectations and attitudes. Personality factors directly influence behavioral intentions, whereas social factors represent external influences that influence both personality factors and behavioral intentions.

Cost and benefits analysis concepts have been successfully applied to predict personality variables. However, the relationship between social exchange theory and planned behavior theory has yet to be fully explored. For example, extensive studies have shown that local people's attitudes toward local tourism depend on the benefits and costs that tourism brings to society (Nunkoo & Gursoy, 2012). In addition, this study also uses the crypto platform variable as a moderator between attitudes and behavioral intentions adapted from research on CAMS-R (Feldman et al., 2014). A study conducted by Xi et al. (2020) found significant differences between Australian and Chinese investors when it comes to choosing cryptocurrencies. The study identified age, gender, education, occupation, and existing behavioral literature as important factors influencing decision-making. Chinese and Australian investors also differ in their prioritization of ICO attributes, as well as their rankings of deterrent factors and investment strategies.

The main question of our research is, do attitudes towards crypto assets positively influence behavioral intentions to invest in assets? Moreover, what are the antecedents of attitude towards investing in crypto? Will a higher reputation level strengthen the positive relationship between attitudes toward crypto assets and behavioral intentions to invest in crypto assets? To test these questions, we conducted a series of surveys to investors in the crypto investment to determine the behavioral intention motivations of investing in the crypto investment. This research is expected to contribute theory related to testing using the theory of planned behavior theory and social exchange theory, thereby adding to the new literature on crypto assets and expanding the findings on the theory of planned behavior theory and social exchange theory in different industrial contexts. After describing the methods and results, this study discusses the findings and outlines the theoretical and

practical implications. This research can complement the existing literature by better understanding the influence of personality and social factors and their interactions on behavioral intentions to invest in crypto assets. New insights from this research can assist in formulating appropriate policies and actions locally and internationally.

The systematics of writing in this paper consists of five parts. First, we discuss the research background, problem formulation, questions, objectives, and contributions. Then in the second part, we discuss the theoretical basis, the formation of hypotheses, and the research model used. Furthermore, in the method part, we elaborate on the research methods used in the form of research design, population and samples, types, data sources, and research methods, as well as testing research instruments and data analysis methods.

2 Literature Review

The objective of this study is to synthesize the theory of planned behavior and the theory of social exchange within a novel conceptual framework. This study provides valuable insights into the examination of the effects of perceived impact and platform reputation on an individual's behavioral intention to invest in cryptocurrency assets.

Behavioral intention shows how motivated a person is to do something and explains the amount of effort that person might put into carrying out that action (Ajzen, 2012). The most effective method of influencing an individual's behavior is to encourage him to develop an intention to adopt the desired behavior. Factors thought to be influencing behavior intention have been explored in several studies (Singh & Kaur, 2021). As Ajzen (2012) suggested, an individual's behavioral intention is a cognitive representation of a person's willingness to implement a particular behavior.

According to one definition, attitude is how a person expresses their overall emotions when engaging in an action, whether positively or negatively. A person's attitude is a reliable indicator of their goals and conduct. An individual's propensity to engage in particular actions is called their attitude, which also defines their expectations and views towards this conduct (Gazali 2019).

A person's attitude could change based on whether or not they believe engaging in particular actions can encourage a specific behavior. Evaluation of the outcomes can strengthen beliefs, and the value of such beliefs is used to predict attitudes toward behavior. People often aim to engage in a behavior when they judge it favorably. People with a positive outlook will consider their motivation for engaging in the action and encourage them to concentrate on that motivation (Bazkiaei et al., 2021).

The theory of planned behavior is one of the models commonly used to predict and understand human behavior (Ajzen, 2012). The theory of planned behavior was first developed by Ajzen (2012), which is the result of developing the theory of

reasoned action. Under the theory of planned behavior, someone's intention to pursue an action can be predicted by looking at the attitude towards the effect of the action and the belief that the action will bring a particular effect. Some correlational studies support the ability of planned behavior theory to predict behavioral intentions, thereby confirming the model's predictive ability (Sharma & Foropon, 2019).

The theory of planned behavior (TPB) has frequently been used in behavioral research to study the various factors influencing human behavioral intention. Feola et al. (2019) used the TPB to examine consumer intentions in choosing banking products, entrepreneurial intentions, and household financing, whereas Gazali (2019) examined the relationship between attitudes, subjective norms, financial risk, and perceived benefits on behavioral intentions to invest in bitcoin. According to Ajzen (2012), the theory of planned behavior (TPB) proposes that human behavioral intention is governed by three fundamental factors: attitude toward behavior, subjective norms, and perceived behavior control (PBC) (Armitage & Conner, 2001).

Recent evidence suggests several predictors of behavior, including the intention to behave and attitude (Saad et al., 2020). However, a previous study has not explained what factors influence intention and behavior for investing in crypto assets. Previous research has described a strong relationship between attitudes and behavioral intentions (Singh & Kaur, 2021). Therefore, focusing on the attitudes variable allows us to understand the determinants of behavior toward investing in crypto investment.

In this paper, an attitude refers to sentiments or opinions toward the consequences of a particular activity. It defines a person's readiness to engage in specific actions and their ideas and expectations around such acts (Gazali 2019). Hence, attitude appropriately predicts a person's intentions and actions. A person's attitude might be gathered from their perspective on acts that may promote the behavior. When persons regard an action favorably, they often desire to engage in it. Positive-attitude individuals will examine their desire to conduct the activity and devote their attention to this aim (Bazkiaei et al., 2021).

The TPB has been utilized in several behavioral research, indicating its usefulness for investigating behavioral intentions. Hence, the TPB is a valuable framework for investigating the elements that impact attitudes and behavioral intentions for crypto asset investments. In this investigation, we thus suggest the following hypothesis:

H1. *The attitude toward investing in cryptocurrency investment affects behavioral intention positively.*

Attitude is the choice of individual beliefs and feelings through positive or negative evaluations of certain phenomena. In this study, we will elaborate on the role of perceived positive and negative impacts on attitude and clarify how significant the correlation is with their behavior and intention to invest in crypto investments.

The relationship between perceived impact and attitudes has also been discussed; for example, there is an argument about the population's attitudes regarding the positive and negative impacts of tourism and support for tourism development (Zhu et al., 2017). The perceived positive impact may manifest as execution costs when

engaging in social interaction. According to Bajs (2015), the perceived cost in proportion to the perceived value affects visitors' behavioral intentions.

Blau (2017) explains that social interaction is a vague exchange process. Social exchange theory is based on the principle that human behavior and social interaction are exchange activities. Social exchange theory is a theory that is widely used in research to determine attitudes about its impact (Nunkoo & Gursoy, 2012). The core discussion of social exchange theory is that the basis of human interaction is the exchange of social and material resources, and a person will try to maximize the results of the exchange (Choi & Murray, 2010).

This study uses perceived positive and negative impacts to investigate the relationship between perceived impact and attitude, as applied in investing in the crypto investment industry. These factors have also been used to examine the tourist sector, with the economic effect being a key consideration in locals' perceptions (Özel & Kozak, 2017). According to the Social Exchange hypothesis, humans rationally seek profit and avoid loss. Hence, support for cryptocurrency investment is driven by people's perceptions that the advantages exceed the disadvantages (Wei et al., 2021). In contrast, the public's opposition to investment likely stems from the belief that the costs outweigh the benefits.

Perceived positive and negative impacts are added as new variables to explain attitudes toward investment to clarify the determinants of behavioral intention to invest in cryptocurrency (Ma et al., 2021). According to Ajzen (2012), attitudes are a person's perspective on a particular behavior, and favorable attitudes increase favorability, increasing the likelihood that the behavior will be carried out. According to earlier research, favorable attitudes toward a particular development are associated with increased support, whereas negative attitudes tend to decrease support (Andereck & Vogt, 2000).

In the case of investing in crypto assets, positive impacts can be perceived in the form of reduced transaction costs and the elimination of intermediaries and government intervention (Edwards et al., 2019), while negative impacts can be seen in the use of cryptocurrency for illegal transactions by criminals, price manipulation, and cyberattacks on crypto holders. The perceived positive or negative impacts of cryptocurrencies play a crucial part in the adoption and interest in participating in cryptocurrency investment, with attitudes toward investment determined by whether the perceived positive impact is more significant than the perceived negative impact (Chen et al., 2020). Based on these arguments, the researchers formulate the following hypothesis:

H2a. *The perceived positive impact on crypto investment positively affects attitudes toward investing in crypto assets.*

H2b. *The perceived negative impact on crypto investment has a negative effect on attitudes toward investing in crypto assets.*

In previous studies utilizing the theory of planned behavior, attitude variables have yielded contradictory findings when attempting to predict intention. While some research indicated a substantial relationship between attitude and intention (Sharma & Foropon, 2019; DeMarree et al., 2017; Feola et al., 2019; Gazali, 2019), others

did not (Juschten et al., 2019; Kumari & Devi, 2022; Leung & Jiang, 2018; Kasri & Ramli, 2019). These studies illustrate the need to incorporate additional variables besides attitude when predicting behavioral intention.

To thoroughly understand the factors affecting the behavioral intention to invest in crypto assets, it is essential to evaluate both intrapersonal and extrapersonal dimensions. In addition to attitude and perceived effects, the reputation of the cryptocurrency platform may also affect investment behavior. Investors seeking new financial opportunities rely heavily on crypto platforms, which allow them to bypass traditional financial intermediaries (Liu & Tsyvinski, 2018). Past research has discovered several characteristics that affect the connection between attitude and intention (Ajzen & Fishbein, 1977).

In light of this, the exchange's reputation may moderate the relationship between crypto investment attitude and behavioral intentions to invest in cryptocurrency investment. Thus, we propose the following hypothesis:

H3. *The exchange reputation moderates the relationship between crypto investment attitudes and behavioral intention to invest in crypto assets.*

3 Research Method

In this study, data was gathered through the distribution of online questionnaires. The non-probability sample selection method used in this study is purposive sample selection. Purposive sampling is a sample selection where the people selected as samples can provide the information needed for research (Sekaran and Bougie, 2016). This study's sample selection criteria included individuals previously invested in crypto assets. According to Hair et al. (2019), the sample size should be ten times the number of items for each variable, so the minimum sample size for this study was 190 participants.

This research employs an explanatory research design. Explanatory research aims to determine whether one or more variables explain the cause or effect of other variables (Cooper & Schindler, 2014). This study employs a quantitative method to explain its findings. This study uses a sample of the Indonesian population that has invested in crypto assets. The sample selection method used in this study is a non-probability sample selection method. The type of non-probability sample selection method used in this study is purposive sample selection.

Because there are no online data regarding the perceived positive impact of investing in crypto assets, the perceived negative impact of investing in crypto assets, or attitudes toward investing in crypto assets, the researchers collected data directly to fulfill their research needs. The questionnaire utilized in this study is an online electronic questionnaire. This study uses SEM (Structural Equation Modeling) for data analysis. This is because SEM can combine multivariate factor analysis and multiple regression analysis (Hair et al., 2019). In addition, the data analysis employed in this study involved the utilization of a statistical testing method

known as variance-based structural equation testing, commonly referred to as partial least squares (PLS). The SmartPLS 3.3.0 program was utilized for conducting this analysis. After ensuring no missing values or outliers, the next step is identifying whether the measurement model uses reflective or formative constructs. Then, test the validity and reliability as described previously, as well as the suitability (fit) of the research model. After verifying the validity and reliability of the measurement instrument and the suitability of the research model, the structural model is assessed. Evaluation of the structural model is carried out to determine the estimation results of the path coefficient (β) and the significance value (P value), which will later be used in hypothesis testing.

In the social sciences, the theory of planned behavior is widely used to predict the behavior of individuals. Three essential components of the theory of planned behavior, namely attitudes, subjective norms, and perceived behavioral control, are crucial aspects of a person's behavioral intention to construct confirmed responses. Attitude is "the degree to which a person has an unfavorable evaluation or assessment of the behavior in question" (Ajzen, 2012). The positive influence of individual investors' attitudes toward cryptocurrencies can be explained by the level of aspired financial stability investors seek, which supports risk-tolerant dispositions (Pham et al., 2021). In addition, Mendoza-Tello et al. (2018) found that some of the positive effects of utilizing cryptocurrencies led to a desire to invest in them.

Attitude is defined as the number of feelings a person experiences to accept or reject a particular object or behavior. It is measured using a system that places individuals on a two-pole scale, such as good or bad, agree or disagree. According to Ajzen (2012), an attitude is an internal condition that influences a person's actions toward particular objects, individuals, or events. Attitudes are cognitive, affective, and behavioral tendencies learned to respond positively or negatively to objects, situations, institutions, concepts, or people.

From the preceding explanation, it is clear that people's attitudes toward a behavior are derived from their behavioral beliefs regarding the consequences of that attitude. Belief in behavior relates behavior to specific outcomes or other attributes, such as negative or positive impacts that occur when carrying out a behavior. In other words, a person who believes a particular behavior can produce favorable outcomes will exhibit positive behavior and vice versa.

The intention is defined here as the desire to act. Intentions are flexible; they can change over time. The wider the time interval, the more likely the intention will change. The theory of planned behavior says that only when a person can control his actions can he act according to his intentions or intentions (Ajzen, 2012).

4 Result

Data was collected using a survey method using a questionnaire in the form of an electronic questionnaire utilizing the Google form feature. To reach the crypto activist community in Indonesia, questionnaires were distributed via various social

media platforms. To measure attitude and behavioral intentions adapted from the article Ajzen (2012), perceived positive and negative impact variables were measured by adapting the article Wei et al. (2021), and exchange reputation variable is measured by adapting the article Feldman et al. (2014). According to the survey results, 190 participants were willing to complete the questionnaire. 151 respondents were between 17 and 25, and 100 were students. Furthermore, it is seen from the data that 133 respondents earn 0 to 3 million rupiahs per month (Table 1).

ATT symbolizes attitude, PI symbolizes the perceived positive impact, NI symbolizes the perceived negative impact, BI symbolizes behavioral intention, and ER symbolizes exchange reputation. Then the instruments in this study were tested using convergent validity, discriminant validity, and reliability tests (Table 2).

The concurrent validity test is valid if the loading factor value is 0.7. However, the loading factor value of 0.4–0.7 is still sufficient for research in the early stages of developing a measurement scale. As for the value below 0.4, then the item is omitted. This study shows only 1 in DN2, below 0.7, which is still considered sufficient for this study (Table 3).

The discriminant validity test is based on the cross-loading value and the square root value of AVE. Cross-loading in this study shows that each item's most significant loading value is collected in the construct column represented by each

Table 1 Characteristics of respondents

Characteristics	Number of respondent	Percentage
Age		
17–25	151	79.5%
26–35	37	19.5%
36–45	2	1.1%
Amount	190	100%
Gender		
Male	110	57.9%
Female	80	42.1%
Amount	190	100%
Occupation		
Student	100	52.4%
Private employees	37	18.4%
Freelance worker	22	11.5%
Other	31	17.7%
Amount	190	100%
Income		
Rp. 0—Rp. 3 Million	133	70.2%
Rp. 3.1 million—Rp. 6 million	40	20.9%
Rp. 6.1 million—Rp. 10 million	8	4.2%
Rp. 10.1 million—Next	9	4.7%
Amount	190	100%

Source: Own work

Table 2 Convergent validity

	Attitude	Perceived positive impact	Perceived negative impact	Exchange reputation	Intention
ATT1	0.908				
ATT2	0.913				
ATT3	0.857				
PI1		0.932			
PI2		0.904			
PI3		0.884			
PI4		0.810			
NI1			0.911		
NI2			0.559		
NI3			0.870		
ER1				0.890	
ER2				0.806	
ER3				0.722	
ER4				0.764	
ER5				0.818	
ER6				0.813	
BI1					0.888
BI2					0.888
BI3					0.870
BI4					0.845

Source: Processed data, SmartPLS Application

Table 3 Discriminant validity

	Perceived negative impact	Intention	Perceived positive impact	Exchange reputation	Attitude
Perceived negative impact	0.796				
Intention	0.023	0.873			
Perceived positive impact	0.010	0.741	0.884		
Exchange reputation	0.101	0.665	0.779	0.804	
Attitude	0.148	0.658	0.741	0.696	0.893

Source: Processed data, SmartPLS Application

construct. Discriminant validity is met if the value of the square root of the AVE construct is greater than the correlation value between the construct and other constructs. The requirements that must be met in the discriminant validity test are to meet the AVE value>0.5. The discriminant validity in this study was stated to be good because the value of the square root of AVE had more weight than the correlation value between constructs.

The reliability test results can be seen from the Composite Reliability (CR) and Cronbach's Alpha (CA) values, with CR and CA values being more significant than 0.7 (Table 4). The reliability test results in this study indicate that the CR and CA values are more effective than 0.7, so it can be concluded that all constructs in this study are reliable. So, all instruments used in this study have good validity and reliability values, as evidenced by having fulfilled various instrument eligibility requirements.

The goodness of fit test on the structural equation model can be seen from the SRMR value of the model in Table 5. The structural equation model is declared to have met the criteria; if the SRMR value <0.10, the model is declared fit, and the model is declared unfit if the SRMR value is >0.15. The results of the goodness of fit test on the structural equation model can be seen in the table, showing that the SRMR value of the model is 0.077. Therefore, if the SRMR value of the model is below 0.10, then this model is declared fit, so it is feasible to use it to test the research hypothesis. The Chi-Square value in the model is 1020.654, and the value is 0.05. This shows that empirical data is identical to the theory or model. The NFI value in the model is 0.711, and the value is <0.9. This model indicates a good model because the estimated models are not related.

The outcomes of the PLS Algorithm Measurement (Outer) Model are depicted in Fig. 1. The measurement model employed in Partial Least Squares (PLS) serves to establish relationships between latent variables and observed indicators, thereby ensuring the reliability, validity, and loadings of the model. This, in turn, enhances the accuracy of subsequent analyses.

In Table 6, path coefficients serve to quantify the strength and direction of relationships between latent variables in the structural model, indicating the impact one variable has on another. Meanwhile, p-values associated with these path coefficients play a crucial role in determining the statistical significance of these relationships. A low p-value from our study suggests that the observed relationships are unlikely to be due to chance alone, providing evidence to reject the null hypothesis and affirm the presence of significant effects.

The direct relationship between the positive impact variable and the attitude variable is characterized by a coefficient value of 0.736, with p-value of 0.000. This observation suggests that the hypothetical relationship under consideration exhibits a positive correlation. The relationship between the attitude variable towards crypto investment and the intention variable is characterized by a direct effect with a

Table 4 Reliability

	Composite reliability	Conclusion
Attitude	0.922	Reliable
Perceived positive impact	0.934	Reliable
Perceived negative impact	0.833	Reliable
Exchange reputation	0.916	Reliable
Intention	0.928	Reliable

Source: Processed data, SmartPLS Application

Table 5 The goodness of fit

	Saturated model	Estimated model
SRMR	0.077	0.086
d_ULS	1.774	2.222
d_G	0.970	1.031
Chi-Square	1020.654	1022.525
NFI	0.711	0.710

Source: Processed data, SmartPLS Application

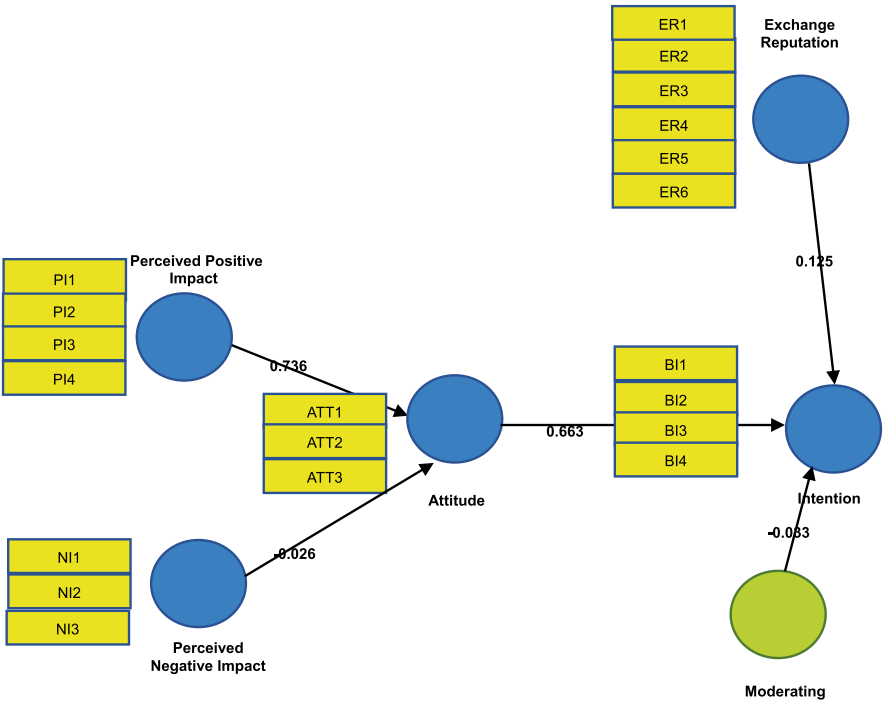


Fig. 1 Hypothesis testing results. Source: Processed data, SmartPLS Application

coefficient value of 0.663. This suggests that the hypothetical relationship is also characterized by a positive correlation. The coefficient value of the moderating effect of the company reputation variable on the relationship between the attitude variable towards crypto investment and the intention variable is −0.033, with a significance level of 0.005. This suggests that the moderation hypothesis is associated with a negative or weakening effect on the relationship between attitudes and intentions. Three hypotheses have a p-value of less than 0.05, and there is only one p-value greater than 0.05, namely the relationship between the perception of a negative impact on the attitude variable and the coefficient value of −0.026. This observation suggests that the hypothetical relationship under consideration exhibits a negative correlation. The study yielded support for three hypotheses while one variable was found to be rejected.

Table 6 Path coefficient test

	Standard deviation (STDEV)	P values
Attitude toward investment in crypto - > intention	0.085	0.000
Perceived positive impact - > attitude toward investment in crypto	0.043	0.000
Perceived negative impact - > attitude toward investment in crypto	0.074	0.060
Moderating effect exchange reputation, attitude toward investment in crypto - > intention	0.039	0.005

Source: Processed data, SmartPLS Application

5 Discussion

This study aims to integrate the theory of planned behavior and social exchange theory into a new model to examine the impact of positive/negative perceived impact and attitude, as well as the interaction of crypto platform reputation, on an individual's behavioral intention to invest in crypto assets in Indonesia.

This finding provides broad support for the work of other studies in this area that have linked attitude and behavioral intention. In this study, we found that an individual's attitude toward crypto investments influences their intention to invest in crypto assets. That is, most of the respondents in this study responded positively to investing in crypto assets to invest in crypto assets. This study also reveals that most respondents agree that they will invest in crypto assets in most of their investment endeavors. Belief in the consequences of a behavior, also known as behavioral belief, determines a person's attitude toward it. Belief in behavior establishes a connection between behavior and particular outcomes or characteristics, such as the negative or positive effects of behavior.

In our study, we also find that an individual's attitude toward investing in cryptocurrencies can be affected by the perceived positive impact of crypto investments. Both intrinsic and extrinsic behavior can be attributed to the perceived positive effects. In this study, it is clear from the respondents' responses that the most significant positive effect is that investing in cryptocurrencies expands their investment opportunities. Overall, the relationship between the perceived positive impact on the attitude of investing in crypto is that most respondents agree that investing in crypto has many advantages that positively impact their attitude.

Unexpectedly, this study found no support for the hypothesis that the perception of a negative impact has a negative effect on investment attitudes toward cryptocurrencies. This indicates that individuals making attitude decisions regarding crypto investments do not perceive the negative impact. Prior research by Bouri et al. (2019) suggested that cryptocurrency investment is subject to herding behavior that appears to vary over time. Evidence of the high degree of co-movement in cross-sectional return dispersion across the cryptocurrency investment implies that crypto traders are copying other people's investment decisions.

In this study, we also discovered that an exchange's reputation influences the relationship between crypto investment attitudes and behavioral intention to invest in crypto assets. It can be concluded that when a company's reputation is positive, the desire to invest in crypto assets is increased.

A new finding indicated that the perceived negative impact had no negative effect on attitudes toward cryptocurrency investment. A possible explanation might be that most people who invest in crypto assets only see the positive results and ignore the negative impact. The findings align with the argument that most people buying crypto follow other users. Based on Kengatharan and Kengatharan (2014) and da Gama Silva et al. (2019) recently tried demonstrating herding behavior among cryptocurrency users. Specifically, through an indirect analysis of the 50 most liquid and capitalized cryptocurrencies, they found that cryptocurrency users tend to follow and copy what other users do in cryptocurrencies. Investment leads to excess volatility, and short-term trends are displayed in this investment (Liu & Tsyvinski, 2018). In particular, herding behavior is a prevalent condition in financial investment, and the financial education of users has no impact on reducing it or directing users to avoid using cryptocurrencies for electronic trading purposes, in line with Arias-Oliva et al. (2019). This phenomenon is even more true for collectivist cultures such as Indonesia. This research makes a practical contribution that individuals and crypto companies need to pay more attention to the process of one's intention to invest in crypto assets and what influences the determinants of that intention. If related to this research, crypto companies should be better regarding reputation because it will help someone commit to investing in crypto assets. Another practical contribution is that crypto companies must maintain their existing reputation.

6 Conclusion

This study presented a substantial opportunity to enhance our comprehension of the behavioral intentions of individuals in Indonesia in regard to investments in cryptocurrency assets. The research findings suggest that the willingness of individuals in Indonesia to invest in crypto assets is significantly shaped by their perception of the benefits linked to such investments. Furthermore, the attitude of an individual has an impact on their willingness to invest in cryptocurrency assets. The exchange's reputation is an important consideration that may either enhance or diminish the aforementioned process. Specifically, the reputation of a cryptocurrency exchange plays a significant function in bolstering an individual's willingness to invest in crypto assets in the Indonesian context.

Several limitations must be acknowledged about the research methods. There are certain limitations on the generalizability of these results. For example, this study only considers the attitude variable as a predictor of intention. Additional research should investigate the antecedents of choice for other variables, including subjective norms and perceived behavioral control. Therefore, further study could be suggested focusing more on irrational behavioral factors to invest in crypto assets.

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The Impact of USDA Wasde Announcements on South African White Maize Futures Prices



Ayesha Sayed and Christo Auret

Abstract The United States Department of Agriculture (USDA) World Agricultural Demand and Supply Estimates (WASDE) releases monthly reports containing valuable information on agricultural projections and expected production. These reports are frequently used by farmers, millers, commodity traders and suppliers, many of whom use futures contracts to mitigate their exposure to commodity price risk. Through an event study analysis, this paper examines the impact of these reports on white maize futures prices listed on the South African Futures Exchange (SAFEX) for the period November 2013 to October 2022. White maize futures contracts remain the most liquidly traded contract on SAFEX and is the only listed white maize contract traded on a futures exchange globally. Furthermore, previous studies have found significant spillover effects from SAFEX-listed white maize onto maize futures listed in the U.S., Brazil, and Argentina. The results confirm significant price reactions, with return variability significantly different from those observed on days preceding and days following the report's release. Given the prominence of maize in food and fuel production, the results have important implications for market participants not only across futures markets, but also for those involved in the production and sale of industrial products requiring maize.

Keywords USDA · WASDE · Price volatility · White maize futures · Event study · Announcement effects

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1 Introduction

An important consideration in industrial economics includes the assessment of risks and the inclusion of commodity forecasts and estimates when evaluating factors of production. Decision makers in the food and biofuel industries are often tasked with production decisions that need to be made before prices are known. Decisions therefore hinge on anticipated prices instead of actual price outcomes. Hence, the ability to accurately forecast grain prices is imperative for protecting organizational profits, the effects of which filter down to the prices consumers pay. Commodities, and in particular grains like maize,[1] exhibit higher price volatility relative to other assets. Given the short-term responsiveness of consumption and production, agricultural commodity prices exhibit amplified volatility; with prices adjusting more rapidly than what producers can accommodate (Dana & Gilbert, 2008; Almanzar & Torero, 2017). This is further reiterated by Silveira et al. (2017) who argue that the supply chains of agricultural products are dominated by buyers, with producers having less bargaining power, placing additional weight on their ability to manage price risk effectively.

Drivers of grain price volatility are classified as endogenous or exogenous (Tadesse et al., 2016; Santeramo et al., 2018). Endogenous causes include shifts in consumption and production levels, acreage allocation, crop yield responses and stock levels. Exogenous causes alternatively include climatic and weather shocks, natural and technological disasters, and shifts in the energy markets. Agents in the agricultural value chain continuously assess and examine both endogenous and exogenous causes to effectively evaluate their exposures so that they can hedge their risks accordingly. Information relating to both endogenous and exogenous drivers is consolidated in a monthly report released by the United States Department of Agriculture (USDA).

The USDA World Agricultural Supply and Demand Estimate (WASDE) reports are published monthly between the eighth and 12th day of the month and provide a reliable benchmark for estimating price changes in agricultural commodities (Janzen, 2022). The report includes season-average farm prices and consensus estimates for several commodities (Adjemian, 2012). Crop reports issued by the USDA date back to 1866 and were published with the intention to keep commercial market participants of commodities informed about market conditions (Adjemian et al., 2018). In their examination of the nexus between crop reports and grain futures markets, McNew and Espinosa (1994) noted a significant reduction in market uncertainty following the release of the USDA crop report. Initially published in 1973, the WASDE report consolidates country-specific supply, demand, and trade data for key commodities. As outlined by Vogel and Bange (1999), the WASDE reports begin with the May report which highlights the forecasting cycle. This contains the upcoming marketing year's first-production estimates. Next farm-level surveys containing maize and soybean production forecasts are released in the August

[1] Also referred to as corn.

report, with frequent updates all through to November. Finally, the January report confirms final production estimates. In addition, grain stock reports are released quarterly in January, March, June, and September. Farm-inventory levels based on government data is also included in the January report. Adjemian et al. (2018) classify the reports from February to April therefore as not "market moving" and note only marginal refinements in them as they remain relatively unchanged.

The comprehensive process and role followed by each of the USDA agencies to create the WASDE reports is detailed by Adjemian (2012). Prevailing prices for crop-based commodities and livestock are set by the Agricultural Marketing Service, while the Economic Research Service analyses how demand and supply fundamentals react to changing market conditions. The impact of policy environment on the behaviour of produces is investigated by the Farm Service Agency and the conditions of country-specific commodities is collected by the Foreign Agricultural Service. Finally, the Joint Agricultural Weather Facility provides weather analyses. Given the sheer volume of data that the report consolidates, an undertaking of this size is near impossible to replicate by any one governmental agency or single private offering. The USDA are not oblivious to the invaluable information provided by the report as they implement strict protocols to prevent the report from prematurely leaking out. All parties involved in the overnight creation of the report are confined to a lockup environment until the report is officially released (Vogel & Bange, 1999). This is reiterated by McKenzie (2008) who found that traders of corn were inclined to purchase crop production reports prior to their anticipated release in August.

The reaction of commodities' spot and futures prices following the publication of USDA WASDE reports has been empirically investigated through the use of event studies. In Fama's (1970) Efficient Market Hypothesis (EMH) price reaction reflects newsworthiness in assets, with the event study framework assuming that markets are less than strong-form efficient. According to Campbell et al. (1997), the basic tenet of event studies tests whether prices are impacted by the release of information as this confirms that this information is worthy to market participants. Several studies have established statistically significant daily price reactions following USDA WASDE report publications. However, they have predominantly been conducted using grain futures listed on the Chicago Board of Trade (CBOT), Intercontinental Exchange (ICE), and Kansas City Board of Trade (KCBT).

The USDA WASDE report is also widely used for grains research in emerging markets like South Africa, where local agricultural reports are susceptible to delays and lack of funding. Statistics South Africa (Stats SA) carries out a national Census of Commercial Agriculture (CoCA) every 5 years (Aguera et al., 2020). The report however could not be conducted in 2012 due to insufficient funding, while the 2017 report was delayed until March 2020. The welfare benefits of USDA reports like the WASDE are also noted by Goyal and Adjemian (2021) who describe the reports as a public good, with a robust history of dependable forecasts, greatly trusted and valued by its end users.

Despite its extensive global usage by both academics and practitioners, the impact of USDA WASDE reports has yet to be comprehensively examined in

emerging markets. There are limited studies to date, most recently by, McKenzie and Ke (2022), who examined corn and soybean futures listed on the Dalian Commodities Exchange (DCE). The objective of this paper is to empirically investigate the impact of USDA WASDE announcements on white maize futures price listed on the South African Futures Exchange (SAFEX). White maize is South Africa's largest produced field crop and the country's staple food, especially for low-income households (Sayed & Auret, 2020). White maize futures contracts are also SAFEX's most liquidly traded contract, and the only listed white maize contract traded on a futures exchange globally. The significance of white maize on a global scale is supported by volatility transmission studies that have found white maize futures to exhibit higher volatility than CBOT-listed corn, with volatility transmission documented to the U.S., Brazil and Argentina (Geyser & Cutts, 2007; Sayed & Auret, 2019). Maize is an important commodity to examine as it is used as a raw material in both food and fuel and for industrial use (Ranum et al., 2014). The international significance of maize, especially in Europe and Asia, has been further highlighted with the start of the Russia-Ukraine conflict. The major exporters of maize globally are the United States, Argentina, Brazil, Ukraine, Russia, and South Africa (USDA WASDE, 2022). The continuing Russia-Ukraine conflict places additional capacity constraints on net exporters aiming to increase production and shipments, due to inflationary costs (FAO, 2022).

According to Summer and Mueller (1989) a peak in volatility observed following the report release encompassed by normal volatility on adjacent days, confirms a significant price reaction in commodity futures prices stemming from the USDA WASDE reports. Therefore, this paper employs an event study methodology for the period November 2013 to October 2022 to examine the effects of USDA WASDE announcements on white maize futures prices. The volatility in returns on the days when the report is released is contrasted against the 5 days preceding and the 5 days following the report to capture an 11-day event window. The study makes use of both standard parametric tests as well as non-parametric tests and the results confirm a significant price reaction in white maize futures prices for both sets of tests. The July WASDE reports are also found to have price reactions that are more pronounced, highlighting that white maize futures prices are influenced by the U.S. corn yield and corn production estimates that is usually contained in July reports.

2 Literature Review

Event studies remain a longstanding and effective type of causal inference research design. Campbell et al. (1997) highlight the efficacy of event studies as they argue that assuming rationality in the market, the impact of an event is instantly observed in asset prices. Consequently, the economic influence of this event can be gauged by reviewing asset prices over a brief window of time. The short-term event study method, pioneered by Dolley (1933) and popularized by Fama et al. (1969), is premised in the Efficient Market Hypothesis (Fama, 1970). It relies on the premise that

asset prices react almost immediately to new market information, thus enabling researchers to quantify the impact of a specific event (MacKinlay, 1997).

Several studies have investigated the price effects on agricultural commodities following the release of USDA reports, other than the WASDE. Summer and Mueller (1989) examined U.S. corn and soybean futures following the release of USDA harvest forecasts and found that significant information was contained in these reports. Similarly, Garcia et al. (1997), investigated the informational value of USDA corn and soybean production forecasts. The results from the price reaction tests showed that the unanticipated components of USDA forecasts significantly affected corn and soybean futures prices. In the livestock category, Colling and Irwin (1990) examined the relationship between live hog futures prices and USDA Hogs and Pigs Reports (HPRs). Hog futures prices were found to generally adjust to unexpected information on the day following the reports' release. Later, McKenzie et al. (2007) investigated hog futures options following the release of HPRs for the period 1985 to 2000. Significant shocks in asset prices were seen prior to the release of the reports.

According to the CME Group (2022), the WASDE serves as perhaps the most important frequent informer of supply and demand shifts for grain markets like maize, wheat and soybeans. Substantial empirical literature exists confirming daily price effects in grain futures markets once the WASDE reports are published. These include, but are not limited to, Isengildina-Massa et al. (2008a, 2008b), Adjemian (2012) and Fernandez-Perez et al. (2019). Isengildina-Massa et al. (2008a) investigated the effects of WASDE reports on U.S. corn and soybean futures from 1985 until 2006. They used an event-study approach and calculated overnight volatility using close-to-open price series which they found had a strong and significant impact. The results showed return variance in corn futures to be close to eight times larger relative to its norm with soybean futures return variability reportedly seven times more than expected. The influence of USDA WASDE reports were also found to increase over time, with the most recent subperiod exhibiting the strongest effects. While the studies by Isengildina-Massa et al. concentrated on single futures contracts, Adjemian (2012) concentrated on various futures contracts for U.S. cotton, soybeans and hard winter wheat. The release of the USDA WASDE report was found to have an instant response in the opening futures prices of each of the commodity futures investigated. Market participants therefore benefitted from the information inherent in these reports given the increased absolute returns observed on report release days. Similarly, Fernandez-Perez et al. (2019) analysed grain futures contracts on U.S. corn wheat and soybean by decomposing bid-ask spreads into liquidity provision and information asymmetry components. Contrasting these components on days with and without USDA announcements, they found high information asymmetry on announcement days. They compared these components on days with and without USDA announcements and found that information asymmetry was significantly higher on USDA announcement days, with bid-ask spreads increasing substantially.

Recently, studies have made use of intraday data to evaluate the effects on agricultural futures of USDA reports being released. These include Lehecka et al.

(2014), and Adjemian and Irwin (2018), among others. Lehecka et al. (2014) empirically examined market reaction for intraday CBOT corn futures for the period July 2009 to May 2012. The strongest reactions were observed closely after the market opened, with shocks persisting for roughly 10 min thereafter, confirming that corn futures prices rapidly incorporated new information following the reports' release. Adjemian and Irwin (2018) also employed intraday grain futures prices in their study and showed that while USDA crop announcements result in heightened price volatility in agricultural futures markets, this dissipated following the first few minutes of trading.

In emerging markets, event studies concerning USDA report releases have commonly taken place in the coffee market, like with studies by Silveira et al. (2017), who examined the impact of USDA crop reports on the prices and volatility of Arabica and Robusta coffee futures listed on the Intercontinental Exchange (ICE). For emerging grain futures markets, only two studies to date have included the USDA WASDE in their analyses, namely Monk et al. (2010) and McKenzie and Ke (2022). Monk et al. (2010) used a linear regression model to identify and quantify the factors affecting volatility in SAFEX-listed July white maize futures contracts. Their regression model included a dummy variable to identify the dates on which the WASDE reports were made public. The WASDE variable was however found to be insignificant. It should be noted however that Monk et al. (2010) investigated volatility on the precise day the report was released and not on the following day. Their study therefore failed to account for the time differences between the U.S. and South Africa as trading has already ceased in South Africa when the report is released in the U.S. More recently, McKenzie and Ke (2022) conducted an event study to explore Chinese soybean and corn futures markets in response to the release of USDA WASDE reports. This marked the first study to investigate the impact of USDA announcements in Chinese grain futures markets. Chinese soybean futures were found to react strongly to the information content in the WASDE reports, while corn futures had a more tempered reaction.

Earlier studies, like the one by Falk and Orazem (1985), argue that content released publicly by the USDA provides economic welfare benefits. However, all these studies have been conducted predominantly in the U.S. agricultural market, with a few exceptions noted by Monk et al. (2010), Silveira et al. (2017) and McKenzie and Ke (2022). To date, no study has empirically examined the impact of USDA announcements on SAFEX-listed white maize futures contracts using all contract delivery months. This paper contributes to the literature by being the first study to examine the impact of USDA announcements on an agricultural futures contract traded on SAFEX. Similar to Isengildina-Massa et al. (2008a, 2008b) and McKenzie and Ke (2022), the influence of the information content in WASDE reports is assessed by contrasting the returns variance on the days the reports are published relative to the days preceding and following the publication. This study makes use of both parametric tests as well as nonparametric tests. The null hypothesis is therefore one of no reaction, which tests that the return variability for event days and pre- and post-event days are equal. If white maize futures prices react to the release of the reports, this would signify that information contained in the

WASDE reports is of value to market participants. In addition, a spike in volatility on event days would pre-empt South African grain merchandisers and other commercial users of SAFEX grain contracts to alter and amplify their hedging and other risk management activities around report release days.

3 Data and Methodology

In order to examine the reaction of white maize futures prices to the release of monthly WASDE reports, an event study methodology is employed for the period November 2013 to October 2022. The events analyzed in this study concern the release of USDA WASDE reports. These reports are released monthly usually between the eighth and 12th day of each month. Before 1994, the WASDE reports were released after U.S. markets had closed (Adjemian, 2012). From May 1994 until December 2012, the WASDE reports were released at 07 h30 U.S. Central Time (CT) (McKenzie & Ke, 2022). Since January 2013 onwards, WASDE reports were published at 11 h00 CT, which is 8 h behind South African Standard Time. The release time of the USDA WASDE report therefore coincides with 19 h00 in South Africa. As trading hours on SAFEX for all grain futures contracts is 09 h00 to 12 h00 (JSE, 2022), any impact on futures prices would only be observed the next trading day when trading resumes at 09 h00. The event day (day 0) in this study is therefore defined as the day following the official release of the WASDE report.

Price reactions following the release of WASDE reports are investigated in nearby futures contracts (also known as nearest-to-maturity contracts) for white maize futures listed on SAFEX. Price reactions in these contracts have been found to represent the best measure of the WASDE's impact as they are traded frequently and hence liquid (Isengildina-Massa et al., 2008a, 2008b; Adjemian, 2012; Fernandez-Perez et al., 2019). Further, Working (1948) asserts that nearby contracts for commodities that can be stored, like maize, reflects the price reaction of both anticipated and unanticipated crop information. White maize futures contracts are priced in South African Rands per ton and delivery contract months are March, May, July, September and December. Table 1 shows the specific white maize futures contracts matched with each WASDE release.

Data for the first to trade (opening) and closing prices for each of the respective futures contracts listed in Table 1 is obtained directly from the Johannesburg Stock Exchange (JSE) Client Portal.[2] Data for the report release dates for all the USDA WASDE reports is sourced from the USDA Economics, Statistics and Market Information System (ESIMS).[3]

[2] This data is publicly available from https://clientportal.jse.co.za/.

[3] This system contains over 2000 publications from the USDA with the site developed and maintained by Mann Library at Cornell University. This data source is also publicly available from: https://usda.library.cornell.edu/?locale=en.

Table 1 Futures contracts used in market reaction test

WASDE release month	White maize futures contract
January	March
February	March
March	May
April	May
May	July
June	July
July	September
August	September
September	December
October	December
November	December
December	March

Note: All contracts refer to white maize futures contracts traded on the South African Futures Exchange (SAFEX)
Source: authors' own work

This paper investigates the impact of USDA WASDE announcements on South African white maize futures prices by following an event-study approach using an 11-day event window. The 11-day event window includes five trading days before the event day (day 0), and five trading days after the event day. The event day is defined as the trading day following the report release day to cater for the time differences between the U.S. and South Africa. Any new information relayed in the report would therefore only be incorporated into prices the following morning when trading begins. Daily close-to-open returns are thus calculated for white maize futures using the closing price on the trading day preceding day 0 (the event day as defined above), and first-to-trade, or opening, prices on the event day. Additional support for the use of close-to-open returns is provided by Isengildina-Massa et al. (2008a, 2008b) and Williams (2001). Following Fortenbery and Sumner's (1990) finding of no measurable price reaction to WASDE reports using close-to-close returns, Isengildina-Massa et al. (2008a, 2008b) replicated and extended their study. However, they instead used close-to-open returns and in contrast found corn and soybean markets to have significant price reactions following the release of WASDE reports. According to Williams (2001), overnight close-to-open returns are more appropriate, especially when WASDE reports are released between trading sessions, as they correctly incorporate the market surprise associated with the report. Instead of close-to-close returns, close-to-open returns are preferred given the effects of daily price limits, which are also known to exacerbate price volatility during trading hours (Sayed & Auret, 2018). If close-to-open returns are used instead, then any market reactions observed overnight can be attributed to the release of the WASDE reports and not as a result of other factors or influences. This is further supported by Summer and Mueller (1989) who argue that using close-to-open returns ensures that any market responses observed are not due to trading activity constraints

implemented by an exchange; but rather capture new information relayed by the report. The percentage daily returns is defined as:

$$R_{t,k} = 100 * \ln\left(\frac{p^{o}_{t,k}}{p^{c}_{t,k-1}}\right), t = 1,2,\cdots,n, k = -5,-4,-3,-2,-1,0,1,2,3,4,5 \quad (1)$$

where t is the monthly report release date for the USDA WASDE. For instance, t = 1 is the initial monthly WASDE report examined in November 2013 and t = 107 refers to the last monthly WASDE report examined in October 2022; k is the trading day, with k = 0 used for the event day in the study (the first trading day following the report's release), k = −5…−1 representing the five trading days prior to the report's release and k = 1 … k = 5 representing the five trading days following the report's release; $p^{o}_{t,i}$ is the opening price (first to trade price) of the nearest-to-maturity white maize futures contract for trading day k and event t; and $p^{c}_{t,k-1}$ is the closing (settlement) price of the nearest-to-maturity white maize futures contract for trading day k-1, and event t, and ln is the natural logarithm.

These close-to-open returns are then transformed into absolute returns to proxy for market volatility. Absolute returns as the proxy for market volatility is often used to avoid trying to define the market's anticipation of the report's release (Isengildina-Massa et al., 2008a, 2008b; Adjemian, 2012). Increased absolute returns on event days would therefore confirm that USDA WASDE announcements affect white maize futures prices, and that the report's inherent content benefits market participants.

Similar to Isengildina-Massa et al. (2008a, 2008b) and McKenzie and Ke (2022), this paper uses both parametric and nonparametric tests to detect significant differences in market volatility on event days relative to pre- and post-event days. The null hypothesis of no reaction is tested using five parametric tests, namely, the two-tailed F-test, the Bartlett test, the Siegel-Tukey test, the Levene test and the Brown-Forsythe test. The close-to-open returns computed were used in the parametric tests. For robustness and to cater for any possible non-normality in the data, the null hypothesis that return variability for event days and pre- and post-event days is equal is also tested using nonparametric tests. The nonparametric tests are applied to the absolute returns that proxy for market volatility. These tests are the Mann-Whitney test, the Kruskal-Wallis test, the Chi-square test and the Van der Warden test. The results for the parametric and nonparametric tests are shown and discussed next.

4 Results and Discussion

Tables 2 and 3 provide descriptive statistics for SAFEX-traded white maize daily futures returns, and daily absolute futures returns respectively. The results in Table 2 show that the mean return for report release or event day returns (0.06) is less than

Table 2 Descriptive statistics of daily white maize futures returns around WASDE report release days

Returns	Observations	Mean	Median	Std. dev.	Skewness	Kurtosis	Jarque-Bera
Event day returns	107	0.056875	0.249965	1.553124	−0.590351	3.673911	8.239949**
Pre-event day returns	535	0.134376	0.000000	1.028808	0.473725	5.426135	151.2221***
Post-event day returns	535	−0.001268	0.000000	1.122699	0.505346	5.577796	170.8997***
Pre- and post-event (normal) day returns	1070	0.066554	0.000000	1.078410	0.473692	5.516728	322.4024***
January event day returns	8	0.758940	0.518368	1.193276	0.110589	2.387668	0.141290
February event day returns	9	−0.313836	−0.623055	1.625891	0.784957	4.055024	1.341640
March event day returns	9	−0.493059	−0.377021	1.545140	−0.288423	2.313263	0.301634
April event day returns	9	−0.171791	0.009950	1.264345	−0.319802	2.231245	0.375029
May event day returns	9	−0.281733	−0.357924	1.064532	−0.309834	1.585213	0.894604
June event day returns	9	0.912535	1.458428	1.444252	−0.089296	1.271607	1.132214
July event day returns	9	−1.123113	−0.255478	2.468702	−0.454275	1.853331	0.802617
August event day returns	9	−0.119923	0.619197	2.127936	−0.371736	1.598267	0.944102
September event day returns	9	0.325109	0.456101	1.164949	−1.267398	3.920714	2.727339
October event day returns	9	−0.235056	0.000000	1.118070	−0.387575	1.864146	0.709134
November event day returns	9	0.564020	0.544246	1.216383	0.507405	2.583536	0.451231
December event day returns	8	1.022005	0.717325	1.067096	1.041114	2.907579	1.448073

Note: ** denotes significance at the 5% level *** denotes significance at the 1% level
Source: authors' own work

Table 3 Descriptive statistics of daily white maize futures absolute returns around WASDE report release days

Absolute returns (Volatility)	Observations	Mean	Median	Std. dev.	Skewness	Kurtosis	Jarque-Bera
Event day volatility	107	1.199401	0.938122	0.981492	1.275397	4.961173	46.16650***
Pre-event day volatility	535	0.745878	0.573232	0.720527	1.939537	8.378337	980.2475***
Post-event day volatility	535	0.810332	0.638238	0.776265	1.945573	8.521130	1017.033***
Pre- and post-event (normal) day volatility	1070	0.778105	0.602865	0.749259	1.951100	8.524417	2039.525***
January event day volatility	9	1.052098	0.844373	0.903959	0.641059	2.358918	0.684937
February event day volatility	9	1.152467	0.687052	1.122553	1.135851	2.663189	1.977777
March event day volatility	9	1.240888	1.386378	0.963678	0.813123	3.385277	1.047404
April event day volatility	9	0.875511	0.597463	0.877174	0.355894	1.478827	1.057729
May event day volatility	9	0.913636	0.737406	0.532381	0.742395	2.296729	1.012197
June event day volatility	9	1.409305	1.458428	0.887845	0.129282	1.595865	0.764419
July event day volatility	9	2.032539	2.119872	1.692905	0.796462	2.492023	1.048293
August event day volatility	9	1.756866	1.877989	1.035323	−0.177214	1.835496	0.555633
September event day volatility	9	0.928957	0.863219	0.710764	0.637383	2.556058	0.683293
October event day volatility	9	0.910320	0.798089	0.616418	0.573079	2.842974	0.501875
November event day volatility	9	1.046949	0.846609	0.777403	1.637149	4.757586	5.178802*
December event day volatility	8	1.022005	0.717325	1.067096	1.041114	2.907579	1.448073

Note: *** denotes significance at the 1% level * denotes significance at the 10% level
Source: authors' own work

Table 4 Parametric tests -variance difference tests between event day returns and normal trading day returns

	F-Test	Bartlett	Siegel-Tukey	Levene	Brown-Forsythe
$H_{0:}$ variance event returns = variance pre-event returns	2.278997***	35.53492***	4.663469***	30.87101***	29.39089***
$H_{0:}$ variance event returns = variance post-event returns	1.913752***	21.32282***	4.140072***	20.06014***	19.26976***
$H_{0:}$ variance event returns = variance pre- and post-event returns	2.074170***	31.24492***	4.604809***	28.33224***	27.55170***

Note: *** denotes significance at the 1% level
Source: authors' own work

those observed for pre-event day returns (0.13), but greater than those observed for post-event-day returns (−0.00); and slightly less than the mean for normal trading day returns which is captured by pre- and post-event day returns (0.07). The median for event day returns however is substantially more relative to pre- and post-event day and normal trading day returns at 0.25 relative to 0.00. Event day returns also exhibit the highest standard deviation relative to normal trading returns. Table 2 also shows that the skewness of the daily returns is fairly symmetrical with values ranging from −0.59 to 0.47. The kurtosis and Jarque-Bera results for the daily returns (used in Table 4's parametric tests) indicate leptokurtic and non-normal distributions, which motivates for the use of nonparametric tests as well.

Table 3 shows that the absolute return's mean and median, which this study uses to proxy for market volatility, is consistently and considerably greater for event day returns than for pre-, post- and normal trading day returns. This result is consistent with Isengildina-Massa et al. (2008a, 2008b) and McKenzie and Ke (2022) and confirms that the release of USDA WASDE reports has a large impact on South African white maize futures prices. The mean and medians for pre-event day and post-event day volatility are negligibly different. This similarity in volatility between the trading days preceding the release of the report and the trading days following the release of the report is also consistent with Insengildina-Massa et al. (2008a, 2008b). Table 3 also shows that event day volatility has a higher standard deviation than pre-, post-event day volatility and normal trading days volatility. Similar to Table 2, the kurtosis and Jarque-Bera results displayed in Table 3 indicates leptokurtic and non-normal distribution. In addition, the skewness in Table 3 indicates that the data is highly skewed. This further motivates for the use of nonparametric tests which makes fewer assumptions about the data and is the preferred variance difference test when the data is not normally distributed (Sawilowsky, 1990).

In addition to the returns surrounding the 11-day event window, Tables 2 and 3 also provides summary statistics for each WASDE release month. This is done to evaluate which month on average experienced the largest volatility (absolute futures

Table 5 Nonparametric tests -variance difference test between event day absolute returns and normal trading day absolute returns

	Mann-Whitney	Kruskal-Wallis	Chi-square	van der Waerden
$H_{0:}$ variance event returns = variance pre-event returns	4.883541***	23.85176***	10.77757***	25.95552***
$H_{0:}$ variance event returns = variance post-event returns	4.147270***	17.20222***	5.932710**	18.22171***
$H_{0:}$ variance event returns = variance pre- and post-event returns	4.718004***	22.26097***	6.472052**	24.56262***

Note: *** denotes significance at the 1% level ** denotes significance at the 5% level
Source: authors' own work

returns). Table 3 shows that the highest mean and median event day volatilities occurred in July. This result is consistent with the views of Monk et al. (2010). According to Monk et al. (2010), not only does July mark the start of the U.S. maize growing season; but important information regarding international yields and growing conditions is made public in the July WASDE report.

In order to test the null hypothesis that returns and volatility for event days differ from those on pre- and post-event days, this study makes use of both parametric and nonparametric tests. These results are displayed in Tables 4 and 5. Table 4 shows the results for the F-test, Bartlett, Siegel-Tukey, Levene and Brown-Forsythe tests. All five tests show that event days following the release of the WASDE report have greater return variance that than observed for pre-and post-event days. These results are significant at the 1% level. For robustness, and to cater for the non-normal characteristics in the data's distribution, four nonparametric tests were also conducted to test the null hypothesis of no reaction. These included the Mann-Whitney, Kruskal-Wallis, Chi-square and van der Waerden tests. These results also found evidence of significant price reactions in white maize futures prices following the release of the USDA WASDE report, significant at the 1% level, with the Chi-square tests significant at the 5% level. These results are also consistent with Isengildina-Massa et al. (2008a, 2008b) and McKenzie and Ke (2022) who verified that the variability in U.S. and Chinese soybean and corn futures markets were notably higher on event days relative to non-event days.

This paper therefore finds significant price reactions in white maize futures prices following the monthly release of the USDA WASDE report, with substantial spikes in volatility observed on event days. Following the argument made by McKenzie and Singh (2011), these results highlight that grain merchandisers should hedge their positions to manage price risk around report release days, as white maize futures prices do react to information contained in the reports. These results are also testament to the continued funding that should be made available to USDA agencies, as reports like the WASDE provide a much-needed public service that is essential beyond U.S. markets. The USDA has had to postpone and, in some

instances, cancel the release of reports like the WASDE due to a lapse in federal funding.[4] The value of public agricultural information has been long debated (Good & Irwin, 2006; McKenzie, 2008) with some studies arguing that agricultural public programs be substituted with private information providers (Salin et al., 1998). However, this study emphasizes that emerging markets like South Africa, who lack equivalent service providers with the same level of efficiency and reliability, depend critically on USDA reports like the WASDE.

5 Conclusion

The USDA WASDE is a publicly accessible report that is published monthly and contains valuable information on agricultural projections and expected production and stocks, including country-specific supply and demand forecasts and global stock-use balances of major agricultural commodities. This paper examined whether white maize futures prices reacted to the release of USDA WASDE reports over the period November 2013 to October 2022. The study focused on white maize futures given its importance to food security and as the most liquidly traded contract on SAFEX. An event study methodology was used, and various parametric and non-parametric tests were employed to examine significant price reactions on report release days in comparison to typical trading days.

The agricultural sector is a key driver of economic growth, especially for countries classified as major exporters. The USDA WASDE reports classify the U.S., Brazil, Argentina, Russia, the Ukraine and South Africa as the leading net exporters for maize (USDA WASDE, 2022). Maize remains one of the most important commodities in the context of global food security, especially as the price of food persistently soars. The Food and Agriculture Organization of the United Nations (FAO) reported an increase in the Food Price Index from 74.8 in January 2000 to 135.9 in October 2022 (Cagli et al., 2023). Research relating to grain price volatility therefore remains imperative to agribusinesses especially in emerging economies as they inform researches, practitioners and policymakers. This paper contributes to grain price volatility research by being the first to examine the impact of USDA announcements on South African white maize futures using an event study methodology. The results confirm significant price reactions in SAFEX-listed white maize following the release of USDA WASDE reports. This paper also contributes to the debate on the benefit-cost discussions around government reports like the WASDE, which represent a public good, as significant price reactions are indicative of their welfare benefits. Market participants outside the U.S. can therefore use the reports to improve their forecasts of maize and to consequently hedge their risks more effectively. This will result in improved resource allocations and efficiencies all along the

[4] https://www.usda.gov/media/press-releases/2013/10/17/usda-announces-cancellation-and-postponement-selected-reports.

supply and value chains for businesses influenced by maize prices. Improved risk management from better timed hedging strategies will not only limit losses for agri-businesses but will also ultimately improve global food security.

Future studies are encouraged to include other emerging agricultural futures markets as research in this area is limited. Further, while this study made use of daily close-to-open returns in the analyses due to data availability constraints, future studies are recommended to make use of intraday data. According to Lehecka et al. (2014) relying solely on daily prices, only assesses if information has been reflected in market prices and fails to account for the pace of adjustment within trading times.

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Voltaic Money Laundering, the Dark Side of Fintech



Agnieszka Wójcik-Czerniawska

Abstract A rapid change in the financial industry has been brought about by the development of financial technology (fintech), which has offered convenience, efficiency, and increased accessibility to financial services. There is, however, a darker side to fintech as voltaic money laundering has emerged alongside these benefits. Through fintech platforms, funds are illicitly transferred and concealed through voltaic money laundering. There are several aspects of solar-powered money laundering discussed in the paper, including client differentiation, rapidity of business deals, currency consideration, worldwide transactions, monitoring gaps, disingenuous political behavior, tax avoidance, and a lack of accountability are some of the aspects discussed in the paper. Fintech's role in enabling illicit financial activities is explored in each aspect. Moreover, the study proposed potential areas for future research on voltaic money laundering and identified limitations in current understandings. There are a number of issues in this regard, including data limitations, fintech's constantly evolving nature, jurisdictional concerns, technological developments, regulatory implications, as well as the socioeconomic effects of voltaic money laundering. This research contributes to the existing literature on financial crime through its examination of the dark side of fintech and offers insights for policymakers and regulators seeking to combat illicit financial activities within this domain. In the digital age, it is extremely important to understand and address voltaic money laundering.

Keywords Fintech · Money laundering · Illegitimate · Fintech scams

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1 Introduction

Innovative financial technologies, or fintech, have revolutionized money management, transactions, and our interactions with banks because they are rapidly evolving. In addition to enhanced convenience and accessibility, fintech has also enhanced efficiency and increased financial inclusion. Despite this, there exists a darker side to technological advancement, where illicit activities thrive, exploiting the very systems and tools designed to empower and protect us from harm. Voltaic money laundering is an alarming phenomenon that occurs within this murky world. By leveraging digital currencies, this illicit practice obfuscates the origins and destinations of illicit funds by exploiting the vulnerabilities inherent in fintech platforms. Money laundering is not a new concept, but voltaic money laundering places an insidious threat on an insidious target that exploits cryptocurrency, peer-to-peer transactions, and decentralized finance.

It is important to first understand the fundamentals of money laundering before one can fully comprehend its dark side. A process of concealing the illicit origins of funds obtained illegally by making them appear legitimate. Traditionally, money launderers have exploited regulatory loopholes and leveraged complex transactional networks by relying on traditional financial institutions to facilitate their operations. Fintech presents a unique set of opportunities and challenges for those involved in illegal activity. Money laundering with cryptocurrencies thrives because of their inherent characteristics of anonymity and decentralization, which do not exist in traditional fiat currencies. Most cryptocurrencies use blockchain technology as their backbone in order to record transactions in a public ledger, which makes them transparent and immutable. As a result, money launderers have exploited this technology's perceived advantages to their advantage.

Unregulated exchanges, anonymous online markets, and digital wallets are among the tools used to launder illicit funds in this shadowy world. As a result of the variety of cryptocurrencies available, criminal networks manipulate the transactions to layer and obfuscate them, making it almost impossible to track them. Decentralized cryptocurrencies can be exploited by money launderers to avoid traditional financial institutions' scrutiny by exploiting the regulatory gaps. Furthermore, the advent of DeFi has created new opportunities for solar money laundering. DeFi platforms offer unparalleled levels of privacy and freedom because they enable financial transactions without intermediaries. Money launderers can easily convert illicit funds into a variety of cryptocurrencies with the help of smart contracts and decentralized exchanges, further obscuring the paper trail and reducing the difficulty of law enforcement agencies tracing transactions.

Regulatory agencies, financial institutions, and governments worldwide face significant challenges due to voltaic money laundering. Existing regulations are struggling to keep up with the rapid evolution of the fintech ecosystem, allowing for exploitation. Innovative and adaptive solutions are needed to combat this illegal practice's complex and elusive nature, and international cooperation, as well as a deep understanding of money launderers' ever-evolving methods, are required. The

crossroads of innovation and criminality lie at the crossroads of unprecedented connectivity and technological advancements. It is important to acknowledge the dark side of fintech that threatens its integrity because fintech has the potential to transform lives and drive economic growth. To combat voltaic money laundering, it is imperative to develop clear guidelines to ensure fintech is used responsibly, and those who attempt to exploit it are prosecuted. This will require collective vigilance and increased awareness.

Voltaic money laundering is being studied because of its potential influence on regulatory frameworks and societal trust as well as its implications for future financial system integrity. To mitigate the adverse effects and stay one step ahead of the criminals, law enforcement officials, financial institutions, and policymakers need to understand the intricacies of this phenomenon.

Voltaic money laundering is explored in this paper as a method of exposing fintech's shadow side. In addition to providing a thorough analysis and presenting novel insight into the methods, mechanisms, and impacts of this emerging issue, we contribute to the literature by providing new insights into the existing literature. The study focuses specifically on the challenges and opportunities that voltaic money laundering presents, emphasizing its unique characteristics as well as the need for tailored countermeasures, whereas previous studies have examined various aspects of money laundering and cryptocurrency-related illicit activities.

Our comprehensive understanding of voltaic money laundering is achieved using a multifaceted methodology that includes extensive literature reviews, data analysis, and case studies. Our research uncovers the latest money laundering techniques, examines fintech vulnerabilities, and explores the regulatory gaps that allow this criminal activity to continue. Voltaic money launderers have developed an intricate network of espionage and fraud techniques, which highlights their adaptability and resourcefulness. Our study also identifies the limitations of existing money laundering regulatory frameworks and proposes strategies to enhance detection and prevention.

Financial technology is generally used to elaborate the latest technology which is improving and automating the providing service and utilization of the fiscal amenities. In view of its fundaments, financial technology is used to support the trades, industries and customers as well to efficiently deal with their monetary dealings, procedures and also exists through developing focused digital mechanisms then procedures which are useable on the digital gadgets and most particularly on the smart cellphones (Majeed et al., 2021). Fintech is a sort of an acronym formed with two words "Finance" and "Technology." It is a compound word. Fintech comprises myriads of echelons of Businesses. It is a broader term. It includes banking systems, export import companies, Digital money transferring systems, etc. Now, money transfer has become very facile in the twenty-first century due to the availability. Off smartphones and saw as the corruption. It has become very hard to track the money transferred for criminal purposes. Financial technology is the term and when it is combined in the twenty first century it was formerly implemented on the technology active on the hindmost finale classifications of recognized fiscal associations (Allayarov & Ravshanova, 2021). However, capital legalizing is yet an international

concern that is challenging the economies and also political permanencies of countries (Kundu, 2019). Nevertheless, to the extent capital legalizing is the global concern since the last few decades it has become evident that the advance states are even added unprotected and at risk to its feats.

The profit earning that is resulted via illegitimate doings obtained by several criminal systems for instance the drug smuggling or human trafficking as well. The unlawful betting stance a solemn risk towards financial arrangements in addition to community security (Dalinczuk, 2021). They are capable to deliver the fiscal reserves to the criminal and also terrorists so they can continue their illegal activities and also grow their illegitimate businesses, challenge the genuine secluded subdivision besides economic marketplaces also reduce income tax returns. Capital legalizing is explained as the procedure through which the unlawful foundations of incomes are veiled to vague the connection among the reserves also in creative illegal goings-on.

2 Indulgent Financial Technology

Largely considering the term financial technology as it is capable to be implemented to particular novelty in what way individuals manage commercial comprising the creation of the electronic currency to dual access towards records of book keeping. As the internet and online banking transformation have directly impacted the financial technology growth and continuous expansion. Financial technology is initially mentioned to processer expertise practical to the hindmost workplace of sets or interchange companies here and now defines a comprehensive diversity of technical interferences hooked on individual also profitable economics. Financial technology mentions towards addition of expertise addicted to contributions through monetary facilities corporations acceptable in the direction of recover their usage plus distribution headed for clients (Barbu et al., 2021). Further, it functioned formerly through It primarily works by inrushing contributions by way of companies also generating fresh marketplaces aimed at them. The start-ups are upset occupants within investment manufacturing through increasing fiscal presence then by means of skill toward expurgate happening working charges (Agarwal et al., 2020). Financial technology backing remains scheduled increase nevertheless controlling difficulties proliferate (Langley & Leyshon, 2021).

Financial technology defines a diversity of fiscal actions for example currency transmissions, placing a checkered through smartphone, through transitory a set division in the direction of putting arranged for recognition, levitation currency aimed at a commercial start-up, management of reserves largely deprived of support from an individual.

3 Fintech Threats and Acquiescence

3.1 Fintech Anti-Money Laundering Risks

Currency legalizers are in association with the latest advancement in the financial technology which is forming latest practices for the feat and to avert defiant currency legalizing acquiescence procedures. Consequently, businesses must be mindful towards subsequent zones with financial technology defiant currency legalizing risk (In light of this, it appears "defiant currency legalizing risk" may be used to indicate bringing a currency or financial instrument into existence that may challenge regulatory frameworks, creating uncertainty. Those who would legalize such a defiant currency would be exposed to inherent risks and could suffer adverse consequences for themselves, their institutions, or the broader financial community as a whole):

3.1.1 Client Distinctiveness

As the financial technology facilities and products are available online, currency legalizers might get benefit with obscurity profits related over internet dealings, acquiescing partial, deceptive including untruthful evidence with the intention of concealing real individualities also evade unwilling currency legalizing panels. Using fintech platforms provides currency legalizers with relative anonymity, allowing them to operate in the shadows. In order to minimize their risk of identification or traceability, these individuals can use anonymous online marketplaces and pseudonyms. As a result, their real identities are protected from unwanted scrutiny due to this level of obscurity.

3.1.2 Business Deal Rapidity

Continuously growing rapidity through online networks revenues as the clienteles might widespread dealings within flashes. The currency legalizers might feat the rapidness through transporting great capacities based on reserves keen on as well as available concerning financial records or else amongst diverse formations rapidly outperforming inspection of ruling classes (Barr et al., 2018).

Clients engaged in currency legalization can take advantage of the speed of digital transactions by using them to communicate and transfer funds. Regulatory authorities cannot keep up with the speed and volume of their transactions because they are capable of engaging in widespread and high-volume transactions within moments. As online networks continue to grow in rapidity, currency legalizers have a greater number of opportunities. In recent years, technology has advanced to the point where money can be moved at lightning speed, allowing currency legalizers to swiftly move large sums of money by using multiple platforms or accounts. By

being agile, they can bypass regulatory oversight because they can handle the volume and pace of their transactions more effectively than traditional government bodies. These business deals can be transacted over a wide variety of platforms and financial accounts, enabling currency legalizers to transfer large amounts of money quickly.

3.1.3 Currency Contemplating

Currency legalizers might utilize the third parties on the way to participating using financial technology facilities contrasting as a mean in order to present unlawful reserves within fiscal arrangement (Miskam et al., 2019). Moreover, such money mules might be exposed participants of the civilization for instance the ageing as well as immobilized including pressured otherwise motivated for contribution in the illegitimate actions.

These third parties are strategically incorporated by currency legalizers in order to disguise the origins and destinations of funds, making it difficult for regulatory authorities to locate the perpetrators of illicit transactions. Currency legalizers minimize detection and prosecution risks by using intermediaries to separate themselves from illegal funds. Intermediaries playing a role in currency legalizers' illicit activities are often referred to as money mules. Many of these illegal acts occur as a result of coercion, manipulation, or enticement of vulnerable members of society, such as the elderly, disabled, and financially disadvantaged. The individuals recruited as participants in illegal activities are vulnerable to the pressures and vulnerabilities faced by currency legalizers.

3.1.4 Worldwide Dealings

Financial technology facilities might be available around the world and can be utilized for transferal of reserves amongst financial records situated within dissimilar states (Covolo, 2020). Currency legalizers might feat the out of country association of financial technology amenities for transferring unlawful reserves for the larger risk prerogatives through rarer as well as fewer rigorous defiant currency valeting reins despite of original bank accounts. (Campbell-Verduyn, 2018).

Transacting across borders using fintech platforms allows currency legalizers to access jurisdictions with less invasive regulations and greater flexibility. Regulators find it more difficult to trace and monitor illegal funds when they move them across borders. Currency legalizers can circumvent regulatory gaps that exist between jurisdictions by exploiting out-of-country fintech amenities. Moreover, currency legalizers can bypass traditional banking channels due to the use of fintech platforms for cross-border transactions. As a result, authorities are unable to detect suspicious activities using traditional monitoring methods, since funds can be transferred without relying on original bank accounts. It is further complicated to

track illicit transactions due to the decentralized nature of some fintech platforms and the use of cryptocurrencies.

3.1.5 Monitoring Gap

The latest innovations and modification of the financial technology facilities frequently outperforms capability concerning fiscal supervisors for addressing illegitimate action. Currency legalizers might be capable to recognize the shortcomings and also the unseeing adverts within directive which establishments do not talked about yet usage of such prospects towards camouflage unlawful reserves (Buttigieg et al., 2019).

Regulatory authorities analyze regulatory directives to identify weaknesses and blind spots, allowing establishments to identify areas where their attention needs to be focused. Their illicit reserves are then concealed and unlawful activities are carried out undetected by exploiting these gaps. Currency legalizers can exploit loopholes in regulation and uncover unaddressed aspects, reducing their risk of detection by exploiting the monitoring gap. In a world where fintech facilitates currency legalization and the facilitation of other illicit activities, fiscal supervisors and regulating bodies face a significant challenge. In order to address emerging risks in the fintech area, regulators should adopt a proactive, adaptive approach.

4 Fintech and Currency Legalizing

The revolution of the internet has altered the old fashioned crime dealings. The increase concerning connected investment organizations, unidentified operational imbursement facilities, peer to peer transmissions within cellphones evidently altered noticing such unlawful transmission regarding currency quite additional challenging. Furthermore, usage concerning substitution online server's also unrecognizable computer software marks constituent of currency legalizing, addition practically incredible to perceive currency might be transported or else reserved within slight yet without any mark of a specific IP address of the device used. Financial technology facilities in the fiscal division are delivering undisputable expediency in the direction of manufacturing also clienteles and in result financial technology is expanding and progressing eventually on daily basis. However, the financial technology growth is directly linked with raising concerns of currency legalizing (Reyes-Mercado, 2021). Further, within the financial technology, currency legalizing is striking intended for criminals since the upsurge within proportion of initiation of transactions in these arrangements, limitless currency stream also the business of unidentified financial records ease currency valeting designed for lawbreakers.

By unremitting intensification within the electronic money distribution, lawbreakers endure their currency valeting actions towards this way (Dyntu & Dykyi,

2019). Moreover, circumstance such as digital defiant currency decontaminating for instance deal legalizing is happening towards replacement of customary defiant currency legalizing. Considering this, it is evident that financial technology is latent objective aimed at currency legalizing illegal administrations. Consequently concerning entire informational, financial technology might vulnerable to the severe anti money laundering menaces. In order to avert these threats and also to diminish unlawful inquiries financial technology must acquire appropriate observes.

Currency similarly be able to valeted over online public sale besides auctions, betting online sites, computer-generated betting situates, where illegally acquired currency is transformed keen on betting money at that time back into actual, practical and undetectable spotless currency. The latest boundary concerning currency legalizing comprises crypto-currencies (Rosales, 2021). Though no completely unidentified yet progressively existence cast-off within extortion arrangements, drug profession also additional illegal actions because of their comparative obscurity associated with additional conservative procedures concerning exchange.

Anti-money legalizing regulations have been unhurried to get closer to such sort of cyber-crimes, subsequently greatest concerning regulations are still founded on noticing filthy currency as it permits over customary investment establishments also networks. It is subsequent terminology for the crypto-currencies have grownup to develop the money of optimal in an extensive variety of connected unlawful actions. Separately as of actuality the favored procedure of imbursement for procurement entered implements and facilities, online manipulative quantifiable, drugs in addition to further unlawful possessions online coating dealings and complicate the source of currency resulting as of illegal movement. Lawbreakers practice a sum of currency legalizing methods connecting cryptocurrencies counting beaters and acrobats which breakdown the linking amongst a statement distribution crypto-currency also the talk getting it.

4.1 Causes that Leads to Money Laundering Through Fintech

There are various causes that contribute to money laundering through Fintech. Some of those are as follows:

4.1.1 Political Disingenuousness

Many politicians have used Fintech as an Ammunition for the gleaning of illegal pecuniary gains. These sponsor terrorists' organizations and other drug trafficking conduits and in turn earn money for deceiving their own countries. For example, RSS and ISIS are financed by the politicians and in turn, politicians are financed by adverse countries for swindling their own countries. Superpowers like US also have influence in such activities. In short, money laundering has many covert shoddy aspects inclined to it and Fintech have made it much easier.

Fintech has introduced new dimensions to money laundering with its integration into the financial sector. It has become increasingly challenging for authorities to trace and interdict illegal financial flows thanks to Fintech platforms, which have a digital infrastructure and a borderless nature. Fintech facilitates illicit financial activities by enabling covert and shoddy money laundering. In combating these illicit practices, regulatory bodies as well as law enforcement agencies face increasing challenges as a result of digital currencies, peer-to-peer transactions, and decentralized finance. A concerted effort is required from both national and international stakeholders to address political disingenuousness in fintech. In order to combat the misuse of fintech for illegal financial gain, regulatory frameworks need to be strengthened, information must be shared, and cooperation must be enhanced between countries, as well as Know Your Customer (KYC) procedures should be implemented.

4.1.2 Tax Evasion

Many shareholders and businesspersons are duplicitous enough to evade taxes and bamboozle their own countries. They might be owners of big factories or humungous companies but they save millions of moneys by tax evasions through the medium of Fintech.

Tax evaders can use fintech to hide their finances and manipulate their financial records thanks to its advanced digital infrastructure. In an effort to lower taxable income or underreport financial transactions, individuals take advantage of tax loopholes by using fintech platforms, which offer anonymity and complexity. Through fintech, tax evaders are able to conduct transactions that are hard to monitor and trace. As a means of concealing their income or to evade their tax obligations, they may use digital currencies and other forms of electronic payments. Tax authorities' efforts to detect and combat tax evasion are further complicated by the decentralized nature of fintech platforms.

4.1.3 Paucity of Scrutiny

The sparsity of investigation while doing transactions using Fintech also adds to the problem. In third World countries, it is very easier and convenient for such miscreants to transfer money using Fintech without the apprehension of being caught red handed.

Regardless of whether an individual is going after legitimate or illicit activities, fintech platforms offer convenience, speed, and accessibility. Miscreants may be able to transfer money without proper investigation due to the ease of conducting transactions via fintech and the limited scrutiny applied by regulators. There could be a lack of robust or well-established regulatory frameworks and supervisory mechanisms in some third-world countries. In this way, illicit financial activities can exploit a loophole. Fintech transactions in these regions are often overlooked

because of insufficient regulation, scarce resources, and limited monitoring capabilities.

4.1.4 Banks Self-Involvement

Many banks are themselves involved in the process of money laundering and the illegally acquired money holders find asylum in them. In turn, the reserves of the banks are raised as well as they contribute to the uplift of economy of their own respective countries. Swiss bank is one such example. This is the most famous bank that protects the laundered money of the unscrupulous politicians and businessmen.

"Swiss Officials have discovered CHF 9 billion (10 billion) in Venezuelan public funds spread across hundreds of bank accounts."

4.1.5 Dearth of Accountability

Third world countries are the most popular countries for money laundering using Fintech. There is no accountability and pandering of duplicitous money launderers is done on mass level. Moreover, politicians can easily escape after looting their own countries.

These countries are prone to money laundering because there are few effective methods for tracking, investigating, and prosecuting those involved in these illegal activities. Money launderers are not held accountable for their actions since there are no consequences for money laundering. Taking advantage of regulatory loopholes, they can carry out complex financial transactions and transfer funds without being detected.

5 Effects of Money Laundering Via Fintech

Such money laundering obliterates the economy of a country as well as impinges the image of the state adversely. Thus, Fintech has enabled the procurement of unchecked money facile. This unchecked acquirement of capital is just at a stone's throw for the receiver and the record keeping is also very cumbersome and onerous which enables money laundering to occur freely.

The economic system, the financial system, and society have been adversely affected by money laundering facilitated by fintech platforms. Financial ecosystem integrity and stability can be challenged by these factors. Money laundering via fintech has the following key effects:

Impact on the economy. The effects of money laundering on developing and developed countries are severe. This undermines market integrity, distorts economic indicators, and hampers fair competition. Artificially inflating asset prices, disrupting markets, and causing bubbles can result from illicit funds injected into the

economy through fintech platforms. A lack of investment confidence can stifle sustainable economic growth, hinder economic instability, and reduce investor confidence.

Integrity of the financial system. Financial integrity is threatened by money laundering. Fintech platforms are used to funnel illicit funds, degrading public faith in financial institutions and disrupting level playing fields. Regulators have a difficult time detecting and preventing illicit financial activities when anti-money laundering measures are undermined by this practice. Financial stability can be undermined and systemic risks may be exposed as a result.

Public services are disrupted. Money laundering proceeds can negatively affect public services when injected into the economy. Healthcare, education, and infrastructure development may be affected by these funds being diverted. Public spending reductions can adversely affect citizens' quality of life, negatively affecting the well-being of society as a whole.

Social Consequences of Inequality. Social disparities and income inequality are exacerbated by money laundering. Secretive channels are often used to transfer illicit funds, causing public revenue to be lost. As a result, the government is unable to finance social welfare programs and close the wealth gap. As a result, poverty and a lack of equal distribution of resources are perpetuated, social tensions are increased, and progress is stifled.

To combat money laundering via fintech, it is necessary to engage in international cooperation, improve regulatory frameworks, develop technology, and build capacity. Financial institutions, governments, and regulators must cooperate to strengthen anti-money laundering measures, improve transparency, and promote responsible use of fintech. The global financial system will remain stable and be protected from the negative effects of money laundering via fintech.

6 Money Laundering Patterns

Crypto-currency interactions revenue domicile on free-for-all stages and frequent circumstances of holdups have happened deprived of consumer's creature intelligent to defend their privileges. Concerning the matter of currency legalizing the unidentifiably of Crypto-currencies has completed its potential to change distrustful possessions which over up in the visions concerning establishments (Custers et al., 2020).

The conversation network permits towards sidestep lawful fiscal mediators in addition to dealings are not harmless. Here resolve continuously be an illegal mediator or an illegal group having dedicated a establish wrongdoing for instance a deal which produced and accrued illegal reserves including drug transferring, abduction, arms trafficking, coercion or fiscal corruption happened earlier the procedure implementation. In the mainstream regarding altogether unlawful dealings currency is swapped for the imbursement of unlawful properties and facilities. It also might be accredited in the direction of possessions concerning currency which permit aimed

at unidentified also irreversible dealings by admiration to third revelries that are not participating in deal, deprived of separation renowned hints intended for exploratory establishments. The money laundering procedure this one entails of three phases which are placement, layering and integration.

Through an exact reference to currency legalizing, money it takes place in the archetypal circumstance of coating the currency such as the removal of slightly conceivable assembly through the preceding fault standby demeanor. In the transmission over cooperation implements of possessions of illegal derivation allocation behavior, in resonant purchasable additional processes heading for delaying the documentation of the wrong source of the possessions measured by way of concluding section heading for following comportment not formerly recognized by the representative and which are the consequence of the imagination within which the illegal collections effort towards reprocess the filthy currency.

Consequently, the secrecy concerning crypto-currencies sideways with a deficiency of regulator by a central expert signifies a tempting opening aimed at currency valeting and in broad for the re-investment of wealth of unlawful source. Though currency filtering is repeatedly the consequence of a multifaceted sequence of dealings yet it is continuously the consequence of three separate phases.

6.1 Placement

Considering the placement, also known as introduction, the money launderer pull-outs particular earnings from the illegitimate goings-on interested in legal fiscal structure. Every so often this specific stage is attained by setting down assets through monetary organizations, gaming club, viable institutions in addition further industries equally voguish local marketplace also into worldwide marketplace (Wang, 2021). Enormous amounts regarding currencies remain distributed addicted to slighter calculations besides placed popular financial records or else elated overseas plus placed in distant financial records otherwise cast-off just before obtaining great worth possessions such as rare art pieces, particular metal products and valuable grits also extravagance vehicles (Bashlakova & Bashlakov, 2020). These possessions might at that time be re-sale in contradiction with disbursement fee via payment otherwise cord transmission.

6.2 Layering

Considering the stage of layering also the satisfaction stage, coatings of succeeding monetary dealings be present accepted on view that create it precise challenging in the direction of renovating movement by currency then now circumstance disengage the illegitimate incomes commencing through foundation (Scharfman, 2021). Frequently in this phase, plentiful transmissions of the different assets are generated

by using various discrete accounts from different fiscal institutions as well (Bilan et al., 2019). Further, the currencies that are transferred might be transformed in form of various other fiscal assets for instance the traveling checks and investments in the real estate or any other legit industry also through buying insurance policies or other profitable security services.

6.3 Integration

Considering the stage of integration in money laundering process, evident lawfulness exists and thoroughly providing headed for the prosperity originating after illegitimate properties by reinstating purified capital interested in factual fiscal structure by various methods which give the impression standard such as the credit by different calculations springing after auctions of possessions, trade of sanctuaries also recoveries of previously purchased policies. As this stage is accomplished capital look like too entirely targets and determinations legitimate and the money launderer might practice it deprived of somewhat confines such as by way of constructing occupied usage by the imbursement mechanisms presented through investment arrangement intended for to some extent thoughtful with deal.

7 Scam Circumstances in Fintech Business

7.1 Black Netting

From side to side Dark Web or black netting currency remains credited in Bitcoin almost by one tenth of the actual worth. The capital attained through the several monetary accounts and also by online scams are transmitted into the account of purchaser by means of western union network. In response, vender demands imbursement in form of Bitcoins aimed at a particular quantity equivalent to a variant percentage of the total amount that has been transmitted. This is how the cybercrimes are often not requires to covenant by the responsibility towards launder currency formerly actuality capable on the way to using, flowing accountability toward individuals that decided to purchase the muted currency on around tenth of the aforementioned actual worth (Nolasco Braaten & Vaughn, 2019). However, it is definitely repeated situation when the Bitcoin in addition further cryptocurrencies makes the situation practically unmanageable in the direction of tracing actual individuality of mutually complements involved in dealings cast-off aimed at illegitimate actions (Kethineni & Cao, 2019).

7.2 Crypto Investment Establishment

Considering the crypto capital corporation, in the year 2019 the polish police has arrested president of this establishment. This fiscal institute has been providing its services to the well-known platforms that has been involved in money laundering globally. Refinement prosecuting attorney specified that this establishment detained bank's financial records in quite trivial country bank in metropolitan of Skierniewice and legalized unlawful profits in the state over digital currency conversation well-founded BitFinex (Chan et al., 2021). Further, recently Molina Lee's actions over this establishment as well as the situation added associate named as the Worldwide Interchange Resolutions obligated remained openly intricate voguish as a kind of gumshoe investment arrangement which providing financial records to digital currency businesses.

7.3 Scam of Coin Ninja

Considering another scam situation, in the year 2020 the United States federal government has under arrest Larry Harmon who is the chief executive officer of the media platform named as coin ninja (Jones, 2022). In general, the CEO be there suspect of leading currency legalizing doings besides consecutively a trade in order to perform conversation with the reserves deprived of precise authorization on or after Fin CEN. In view of seizure permit trailed now in initial month of February, he might partake legalized above three hundred thousand Bitcoin which is equal near 3 million dollars on while of business letting consumers correspondingly a definite confidentiality also secrecy means that is a shadowy network quest device towards conduct on actual general shadowy marketplace nevertheless sealed in the year 2017. Intended for such misconducts the CEO is liable to appearance a custodial verdict of approximately 30 years.

7.4 Scam of Company Named as Wire Card

A major monetary embarrassment concerning the internet based installment organization Wire card has been continuous in Germany since June 2020, following the disclosure of a setback of 1.9 billion euros that was thought to be saved as trust assets in two banks in the Philippines however never existed. The previous CEO of Wire card has been confined on doubt of misrepresentation in Germany, while his ancestor has evaporated in the wake of escaping the country. Wire card likewise acknowledged installments for a Maltese web-based gambling club that was subsequently blamed for laundering cash for a strong individual from one of Europe's most destructive mafia associations, as indicated by the Financial Times. Centurion

Bet, a Malta-based betting partnership, was subsequently found by Italian appointed authorities to be an instrument of shipping cash out of the country in a modern illegal tax avoidance conspire. Centurion Bet, which was joined in Malta however claimed by a Panamanian business, kept on exchanging with Wire card until 2017, while its gaming permit was suspended by the Maltese specialists and it stopped exchanging following a 68-man against mafia strike. More than 30 people have been indicted for mafia-related offenses from that point forward. Despite the fact that Centurion Bet's deals were a little piece of Wire card's general income, the disclosure raises more questions about the German organization's business procedure, which was previously viewed as a trailblazer of European Fintech. Wire card is relied upon to adhere to solid enemy of tax evasion regulations as an authorized installment establishment and to report presumed exchanges to the proper specialists. Wire card likewise dealt with installments for a bigger Maltese betting organization being scrutinized by Italian police for tax evasion for coordinated wrongdoing. Wire card could have been completely uninformed of the company's potential ties to organized crime.

8 Conclusion

Since the Fintech AML process requires a lot of information, organizations ought to remember consistence programming for their AML program. Savvy consistence innovation mechanizes information investigation, further developing rate and productivity while bringing down the gamble of exorbitant human blunders. Savvy consistence innovation likewise empowers organizations to rapidly conform to changes in criminal techniques as well as administrative changes executed by monetary controllers to address the growing Fintech hazard picture. Fraud and online blackmail, for example, ransomware assaults, are turning out to be progressively normal risks in the advanced economy. Aside from the helpful parts of Fintech, tax evasion is a basic cycle that can be done with next to no balanced governance.

Because of the obscurity issues of online administrations, Fintech firms ought to think about extra systems for instance, the social occasion of computerized biometric information like face, voice, and finger impression examines, notwithstanding the standard gathering of names, locations, and birth dates. Surprising exchange examples and amounts, as well as exchanges implying high-hazard wards, should raise warnings for organizations. Clients who are dependent upon worldwide approvals might attempt to dodge the assents by utilizing Fintech administrations. Clients ought to be screened against appropriate worldwide authorizations records by Fintech organizations. Client inclusion in monetary violations is habitually announced in the news. Firms should screen for negative media that influences their clients consistently, including news from conventional screen and print sources as well as online ones.

It is important to acknowledge several limitations in the study of voltaic money laundering, the dark side of fintech. Future research and exploration can take

advantage of these limitations. Future research should focus on the following limitations and potential areas:

1. There are limited reliable and comprehensive data available to study voltaic money laundering due to limited data availability. Since illicit financial activities are clandestine, it's difficult to obtain accurate and complete information about specific cases or the total amount of voltaic money laundering. The use of machine learning and artificial intelligence could be used to detect patterns in financial data in future research to overcome this limitation.
2. In Fintech, new technology platforms, regulatory frameworks, and platforms are constantly being developed. A future research program should analyze how these developments will impact voltaic money laundering.

The dark side of fintech, voltaic money laundering, needs to be explored in future research by addressing data availability limitations, keeping up with fintech trends, addressing jurisdictional issues, exploring technological solutions, analyzing regulatory implications, and studying socioeconomic impacts. Researchers can improve understanding of voltaic money laundering in the fintech domain by studying these topics and developing effective strategies to combat it.

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Part VIII
Eurasian Economic Perspectives: Monetary Economics

The Effectiveness of the Transmission Mechanism's Credit Channel: A Case Study of the Visegrad Four Countries



Liběna Černohorská and Pavlína Kalibánová

Abstract This article aims to evaluate the impact of the transmission mechanism's credit channel in the countries of the Visegrad Four (V4) for the period of 2007 to 2021. The analysis examines the dependence between the selected central banks' interest rates and the amount of loans provided to nonfinancial business entities (loans) and subsequently the dependence between loans and gross domestic product (GDP) in the V4 countries. The analysis is conducted using time series analysis. The empirical results did not indicate the presence of long-term relationships between the selected variables for the V4 countries. In all the V4 countries, a mutual short-term relationship was seen between the given country's basic central bank interest rates and the amount of loans provided to non-financial business entities and, at the same time, between loans and GDP. On the basis of these results, it can be stated that the monetary policy transmission mechanism's credit channel is effective in the V4 countries only in the short term. Monetary policy's credit transmission mechanism was seen to operate both for the autonomous central banks—in the Czech Republic, Poland, and Hungary—as well as for the National Bank of Slovakia, which is subject to the European Central Bank's policy.

Keywords Central bank · Credit channel · Granger causality · Monetary policy · The Visegrad group · Transmission mechanism

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1 Introduction

The Visegrad Group, also called the Visegrad Four or the V4 for short, is a regional grouping of four countries from Central Europe. It includes the Czech Republic, Hungary, Poland, and Slovakia. The group was created on Feb. 15, 1991. The V4's primary tenet is to cooperate and increase stability in the region of Central Europe. Even though this has held true from the group's creation until the present, the V4's specific goals have undergone significant changes during the span of its existence. With regards to their common history—their requisite conversion to a democratic system and market economy—these countries have necessarily encountered similar problems. After the V4's creation, these countries had to contend with significant changes within their economies. These changes arose when the countries converted their centrally planned economies, which had been implemented under Communist totalitarianism, into market ones. The post-Communist countries were not prepared for such processes of transformation, because they did not have the requisite knowledge. Despite this, the former Eastern Bloc countries managed to undergo transformation very rapidly (Kornai, 2006).

In 1989, the basic state of the individual V4 countries' economies before their comprehensive regime change was characterized by relative stagnation in GDP. The former Czechoslovakia's growth rate was 1.4%, Hungary's 0.7%, and Poland's was 0.2%. Linked to the commencing economic transformation, a 3-year phase of declining GDP followed. Hungary was the exception during this period, with a recession that continued into 1993. In the subsequent years, the V4 countries' economic development was marked by economic reforms. The only country that saw a drop in GDP up to 2004 was the Czech Republic in 1998 and 1999. The phase of development following entry to the EU was a period of advancement for the V4 countries at both the quantitative as well as qualitative levels. With the exception of Hungary, whose economy stagnated on account of an economic imbalance in 2007 and 2008, the other V4 countries underwent a period of economic expansion and real convergence with the EU up to 2009, with their GDP fluctuating between 3 and 10%. The year 2009 signified a drop in GDP for the economies of all V4 countries a consequence of the global economic crisis. From the start of our analysis period until the onset of the financial crisis, the highlighted central banks primarily utilized traditional monetary policy, adjusting interest rates as needed. The financial crisis revealed that this approach wasn't exclusive to the Czech National Bank (CNB), the European Central Bank (ECB), the Narodowy Bank Polski (NBP), and the Magyar Nemzeti Bank (MNB); also the Federal Reserve System and the Bank of England were forced to begin using unconventional monetary policy tools, because conventional tools failed in meeting the established inflation goals. The crucial moment for using unconventional monetary policy instruments was when interest rates essentially hit zero or even negative values and economic development required further easing of monetary policy.

The modern banking structure, coupled with global economic integration, financial innovation, and other elements, leads to unpredictable relationships between

fluctuations in the money supply and macroeconomic indicators. This further affects the influence of central banks and various economic players. A significant challenge in monetary policy is the lack of a direct link between the instruments central banks use and the objectives they aim to achieve. Central banks aim to reach their objectives by using monetary policy instruments that operate through a transmission mechanism, affecting various policy channels at once. Over the past two decades, monetary policy has predominantly focused on influencing aggregate demand through the adjustment of interest rates, considered an external factor. By modifying these rates, central banks can respond to variations in inflation from set targets and to shifts in GDP around its potential value.

According to Mishkin (2018) understanding the mechanisms of monetary transmission is key to answering a wide range of economic questions, for example, which monetary policy instrument is suitable to use in various phases of the economic cycle, or even in periods of economic or financial crisis. When interest rates approach zero, it presents a significant challenge as traditional expansionary monetary policies lose their efficacy in the face of negative economic shocks. As a result, the need arises for low or even negative interest rates to stimulate the economy. Faced with this scenario, central banks turn to unconventional monetary strategies to rejuvenate economic activity. These strategies include approaches such as quantitative easing, where securities are purchased, and interventions in foreign exchange. The global financial crisis starkly illustrated the potential for economies to evolve in a nonlinear manner in upcoming years. When traditional expansionary monetary policies falter in the face of negative economic shocks, the zero interest rates becomes quite a big problem. Consequently, the adoption of low or even negative interest rates becomes imperative for economic recovery. With regard to the arguments presented by Wu and Xia (2016), Williams (2014), and Svensoon (2015), central banks in these scenarios lean towards unconventional monetary policy measures. Initially, quantitative easing aimed to bolster the health of banks, but its focus has since shifted to enhancing bank lending, which, in turn, is expected to positively influence economic growth and stave off deflation. Prior to the financial crisis, research by Reifschneider and Williams (2000) as well as Coenen et al. (2004) indicated that with an inflation target around 2%, zero interest rates are an infrequent occurrence in economies and typically persist for a short period. A shortcoming of these studies is that they are based on linear models. Mishkin (2011) emphasizes the importance of having a clear and transparent framework for monetary policy that can guide central banks in making decisions during times of crisis. He highlights several key lessons learned from the global financial crisis of 2007–2008 and suggests strategies to enhance the effectiveness of monetary policy. In this article we aim to evaluate the efficacy of monetary policy during times of low interest rates post-financial crises, focusing on the credit channel mechanism in the V4 countries.

This paper aims to evaluate the impact of the transmission mechanism's credit channel in the Visegrad Four (V4) countries for the period of 2007 to 2021. The study will examine the relationship between central bank interest rates and the volume of loans extended to non-financial business entities, followed by an exploration of the correlation between these loans and the gross domestic product (GDP) in the

V4 countries. Through our time series evaluation, we have investigated the existence of short term and long term relationships among the selected economic variables and whether the transmission mechanism's credit channel is effective.

2 Literature Review

Transmission mechanisms act simultaneously on multiple monetary policy channels. Regarding the monetary policy transmission mechanism, this means causal relationships that central banks utilize to achieve their monetary policy goals. How monetary policy operates can be described with the help of four transmission mechanism channels. Central banks must predict whether a specific instrument can cause a change in the operational goals, whether the change in the operational goal can cause the required change in the intermediate goal, and finally whether the change in this goal has a precise impact on the end goal. Moreover, the transmission mechanism operates via multiple channels simultaneously. These channels include the effects of interest rates, currency exchange rates, other asset prices, and the so-called credit channel. Mishkin (2018) and Chmielewski, et al. (2020), for example, have dealt with a more detailed presentation of individual transmission mechanism channels. The credit transmission mechanism is the channel between the demand for loans on behalf of bank clients (households and businesses) and the banks' loan offerings. According to Mishkin (1996), the bank loan channel derives from the opinion banks play a special role in the financial system, because monetary policy influences small companies' expenditure more than it does large ones. This happens because small companies are more dependent on bank loans than large companies, which can enter the loan market directly via the stock and bond markets with no need for a bank. Bernanke and Gertler (1995) began a discussion on the role of loan offerings for reinforcing monetary policy's effects; they present another thought on the transmission mechanism's credit channel, in which stricter monetary policy leads to increased premiums for external financing because of the imperfection of the credit market.

It is difficult to predict how effective the transmission mechanism is in regards to monetary policy measures' impact on economic development and price levels, because there is a long and unclear, but definite time delay (ECB, 2017). Every central bank intervention has economic repercussions with a specific time delay that starts the moment an economic reaction becomes required. This is because of the fact that recognizing the actual state of the economy is not easy, primarily on account of data availability. Policy measures for macroeconomic stabilization are only implemented when it is clear that, for example, there is a change in cycle phase, which causes a delay in the central bank's reaction. Currently, there are differing opinions on how the time delay for specific measures (central bank interventions) is reflected in economic data, including the size of their impact. Mishkin (1996) states that monetary policy is a powerful instrument, although it sometimes has an unexpected or undesirable impact. In order for monetary policy to be

implemented successfully, central banks must precisely judge the timing of their policy's economic effects. In other words, it is necessary to understand the mechanism by which monetary policy acts on the economy. Academic studies on the monetary policy transmission mechanism (e.g., Ascari and Haber (2022), De Boeckx et al. (2020), Gambacorta et al. (2014), Aleem (2010), and Agha et al. (2005)) indicate that the ways different countries' economies react to monetary shocks are rather diverse.

Several authors, including Pazardjiev and Vasilev (2021), Nenovsky and Hristov (1999), Sarajevs (2000), and Vetlov (2000), have discussed the impacts of the transmission mechanism in the countries of Central and Eastern Europe. Meanwhile, some researchers such as Izak (1998), Reichel et al. (2019), Anagnostou and Gajewski (2019), Chmielewski et al. (2020), and Dovciak (1999) have focused on one of the V4 countries specifically. These studies often faced challenges due to the paucity of data. Others have conducted comparative analyses on the effects of the transmission mechanism across the countries of Central and Eastern Europe. Notable works in this area include those by Krušec (2011), Oros and Romocea-Turcu (2009), Ganev et al. (2002), Mercea (2020), and El-Shagi and Tochkov (2022). In their studies, most of these authors utilized vector error correction models or Granger causality to determinate the impacts of the monetary policy transmission mechanism.

Academic papers that deal with the transmission mechanism in Central and Eastern European countries starting at the beginning of their economic transformation tend to be distinguished by conclusions with multiple outcomes. Academic papers do not contain much evidence for the transmission mechanism having any clear impact in Central and Eastern European countries. Most studies primarily deal with the transmission mechanism's interest rate channel and try to find certain mutual relationships between central bank interest rates and commercial bank interest rates for deposits and loans. Nonetheless, mutual relationships between the indicators they observed have only rarely been confirmed. Indicators such as the currency exchange rate or monetary aggregates have been examined only exceptionally. In the studies listed above, no relationships were discovered between the selected indicators, i.e., the respective central banks' interest rates and the end monetary policy goal—such as GDP, inflation, savings, investment, or consumer spending. Another end goal of monetary policy, wages and unemployment, was not examined in any of the studies. Most of the conclusions in academic studies by Nenovsky and Hristov (1999), Izak (1998), Sarajevs (2000), Vetlov (2000) and Dovciak (1999) indicate that the transmission of monetary policy should improve over time. The argument is that signals for monetary policy will be much clearer and public reaction more stable and predictable as the process of European integration, which includes the related increase in financial intermediation and institutional and structural reforms, continues—the end result being that monetary policy will become more effective. As was naturally added in later studies by Ascari and Haber (2022), Mercea (2020) and Pazardjiev and Vasilev (2021), an interval of two decades did not reveal that the monetary policy transmission mechanism had become more effective; thus, the assumptions of authors from the start of this century were not upheld.

3 Methodology and Data

With respect to this paper's established goals, time series containing the variables of inflation, GDP, the respective banks' basic interest rates, and the amount of loans provided to non-financial entities have been analyzed for the countries in question. The data was derived from Eurostat (2022). The concept of cointegration was initially introduced by Granger (1981) in the context of utilizing time series analysis in econometric models. It is essential to acknowledge the influential work of Engle and Granger (1987), where they advocated a unique approach to time series analysis that diverges from conventional econometric models. This work is foundational to the field of time series cointegration. Other significant studies that address cointegration systems include those conducted by Stock and Watson (1988), Phillips and Loretan (1991), Park (1992), and Chan and Tsay (1996). The Engle-Granger cointegration test enables the determination of long-term correlations between economic variables, while Granger causality tests allow for discerning short-term relationships between the variables under consideration.

To determine long- and short-term relationships, relationships found in quarterly data for the selected central banks' basic interest rates (CNB, 2022; ECB, 2017; NBP, 2022; NBS, 2022 and MNB, 2022), GDP (Eurostat, 2022), and the amount of loans provided to non-financial entities (Bank for International Settlements, 2021) were examined for the years 2007 and 2021. Table 1 shows the abbreviations and descriptions of the variables used in the time series analysis.

The data are seasonally cleaned, thus it was not necessary to test for seasonal influence. We performed logarithmic transformation on the time series in order to achieve log-normal distribution for these series. The logarithmic time series are denoted by *l_IR_CZE, l_ GDP_CZE*, etc. In the framework of ADF tests and in testing Granger causality, we worked with time series that we differenced. In the case of first differencing we denote these time series as *d_l_IR_CZE, d_l_GDP_CZE*, etc. Descriptive statistics of monitored time series is given in Table 2.

During our ADF testing and Granger causality analysis, we utilized differenced time series. The Gretl program was our tool of choice for performing the statistical assessment. For every observed indicator, we implemented tests for six lag orders, equivalent to a six-quarter delay, which is consistent with economic theory (for additional details, refer to Mankiw, 2014). This duration is also the maximum time lag that most central banks prescribe for monetary policy. We employed this confirmed fact in our ADF test (to identify long-term interrelationships) and the Engle-Granger cointegration test (to identify short-term relationships). The ADF test is commonly applied to ascertain autocorrelation, and it operates under the following null hypothesis:

$$H_0 : \Delta y_t = \psi y_{t-1} + \sum_{i=1}^{p} \gamma_i \Delta y_{t+1} + \varepsilon_t \, pro\psi = 0 \tag{1}$$

Table 1 Description of variables used for analysis

Variable abbreviation	Variable description
IR_CZ	Central bank interest rate in the Czec republic
LO_CZ	Loans provided to nonfinancial business entities in the Czech Republic
GDP_CZ	Gross domestic product in the Czech Republic
IR_SK	Central bank interest rate in Slovakia
LO_SK	Loans provided to nonfinancial business entities in Slovakia
GDP_SK	Gross domestic product in Slovakia
IR_PL	Central bank interest rate in Poland
LO_PL	Loans provided to nonfinancial business entities in Poland
GDP_PL	Gross domestic product in Poland
IR_HU	Central bank interest rate in Hungary
LO_HU	Loans provided to nonfinancial business entities in Hungary
GDP_HU	Gross domestic product in Hungary

Source: Authors' own work

Table 2 Descriptive statistics of monitored time series

Variable abbreviation	Mean	Median	Standard deviation	Minimum	Maximum
IR_CZ	1.03	0.75	1.09	0.05	3.75
IR_SK	0.93	0.25	1.41	−0.50	4.75
IR_PL	2.72	2.50	1.62	0.10	6.00
IR_HU	3.92	2.60	3.16	0.60	11.5
GDP_CZ	1.08e+006	1.03e+006	9.21e+004	9.72e+005	1.26e+006
GDP_SK	1.93e+004	1.90e+004	2.81e+003	1.33e+004	2.49e+004
GDP_PL	4.11e+005	4.00e+005	5.82e+004	3.19e+005	5.20e+005
GDP_HU	7.65e+006	7.37e+006	7.56e+005	6.80e+006	9.16e+006
LO_CZ	2.55e+006	2.59e+006	4.71e+005	1.66e+006	3.24e+006
LO_SK	1.57e+004	1.58e+004	3.89e+003	5.98e+003	2.12e+004
LO_PL	7.58e+005	7.60e+005	2.19e+005	3.47e+005	1.11e+006
LO_HU	2.57e+007	2.52e+007	4.32e+006	1.66e+007	3.89e+007

Source: Authors' own work

where X_t is the dependent variable, p is lag, and e_t is the residual component. Whether the variables contain a unit root is investigated using this equation as its basis. The ADF test establishes the following hypotheses:

- H_0: the time series is not stationary
- H_1: the time series is stationary.

When the data in question be non-stationary, implementing first (or even second) differencing could help attain stationarity. Engle and Granger (1987) introduced a cointegration test, a modification of the aforementioned ADF test. This test either corroborates or refutes the null hypothesis.

$$H_0 : \Delta \varepsilon \hat{}_t = \psi \varepsilon \hat{}_{t-1} + u_t pro \psi = 0 \tag{2}$$

where the hypotheses can be established as follows:

- H_0: the time series is not cointegrated
- H_1: the time series is cointegrated.

When a time series is cointegrated, it signifies a persistent, long-term relationship between the variables under examination. Conversely, if a time series lacks cointegration, it indicates the absence of such a long-term relationship between these variables.

Causality testing is viewed as a critical aspect in the examination of multidimensional time series. Based on Granger's assumption in 1981, the prediction of a specific time series could be improved if it is causally influenced by another time series. This exploration of causality is commonly executed with the aid of a vector autoregression model (VAR model):

$$Y_t = \sum_{i=1}^{p} \alpha_i Y_{t-1} + u_t \tag{3}$$

$$Y_t = \sum_{i=1}^{p} \alpha_i Y_{i-1} + \sum_{i=1}^{p} \beta_i X_{t-1} u_t \tag{4}$$

where X_t and Y_t are time series of the variables being examined, α_i and β_i are the variables' coefficients, u_t indicates the error term, and p lag. The hypotheses can be established as follows:

- H_0: the time series is not causal
- H_1: the time series is causal.

If the null hypothesis is rejected, there is a short-term relationship between these variables, thus variable X influences variable Y or the reverse.

4 Discussion of the Results

4.1 Testing the Stationarity of the Time Series

For determining long- and short-term relationships between the variables in question, we must test for the time series' stationarity. The ADF test is employed to confirm if the time series are stationary, as demonstrated in Tables 3 and 4.

In order for us to achieve stationarity for the time series, we conducted differencing on them using the first difference (Tables 5 and 6).

Table 3 The results of the ADF test for interest rates and loans

Time series	*p* – value	H_0 *	Evaluation of ADF test results
l_IR_CZ	0.8251	Not rejected	Time series non-stationary
l_LO_CZ	0.3058	Not rejected	Time series non-stationary
l_IR_SK	0.9669	Not rejected	Time series non-stationary
l_LO_SK	0.1921	Not rejected	Time series non-stationary
l_IR_PL	0.6647	Not rejected	Time series non-stationary
l_LO_PL	0.1091	Not rejected	Time series non-stationary
l_IR_HU	0.7457	Not rejected	Time series non-stationary
l_LO_HU	0.9234	Not rejected	Time series non-stationary

Source: Kalibánová (2022)

Table 4 The results of the ADF test for loans and GDP

Time series	*p* – value	H_0 *	Evaluation of ADF test results
l_LO_CZ	0.3466	Not rejected	Time series non-stationary
l_GDP_CZ	0.8823	Not rejected	Time series non-stationary
l_LO_SK	0.1405	Not rejected	Time series non-stationary
l_GDP_SK	0.7271	Not rejected	Time series non-stationary
l_LO_PL	0.1091	Not rejected	Time series non-stationary
l_GDP_PL	0.2723	Not rejected	Time series non-stationary
l_LO_HU	0.9234	Not rejected	Time series non-stationary
l_GDP_HU	0.3107	Not rejected	Time series non-stationary

Source: Kalibánová (2022)

Table 5 The results of the ADF test for interest rates and loans—first difference

Time series	*p* – value	H_0 *	Evaluation of ADF test results
d_l_IR_CZ	0.01215	Rejected	Time series stationary
d_l_LO_CZ	0.02148	Rejected	Time series stationary
d_l_IR_SK	0.03329	Rejected	Time series stationary
d_l_LO_SK	0.002×10^{-2}	Rejected	Time series stationary
d_l_IR_PL	0.00295	Rejected	Time series stationary
d_l_LO_PL	0.00019	Rejected	Time series stationary
d_l_IR_HU	0.01580	Rejected	Time series stationary
d_l_LO_HU	0.01657	Rejected	Time series stationary

Source: The authors' own work based on Kalibánová (2022)

4.2 Determining the Time Series' Interdependence Using the Engle-Granger Cointegration Test

After confirming the nonstationarity of the original time series using the ADF test, which is the prerequisite for testing the time series for cointegration, we proceeded to cointegration analysis. We used the Engle-Granger test to explore the possibility of a long-term relationship between the variables, as illustrated in Tables 7 and 8.

Table 6 The results of the ADF test for loans and GDP—first difference

Time series	p – value	H_0 *	Evaluation of ADF test results
d_l_LO_CZ	0.01184	Rejected	Time series stationary
d_l_GDP_CZ	0.00011	Rejected	Time series stationary
d_l_LO_SK	0.004×10^{-3}	Rejected	Time series stationary
d_l_GDP_SK	0.00167	Rejected	Time series stationary
d_l_LO_PL	0.00019	Rejected	Time series stationary
d_l_GDP_PL	0.009×10^{-7}	Rejected	Time series stationary
d_l_LO_HU	0.01657	Rejected	Time series stationary
d_l_GDP_HU	0.002×10^{-5}	Rejected	Time series stationary

Source: Kalibánová (2022)

Table 7 The results of the Engle-Granger cointegration test for interest rates and loans

Time series	p – value	H_0 *	Evaluation of EG test results
l_IR_CZ / l_LO_CZ	0.2846	Not rejected	No cointegration
l_LO_CZ / l_IR_CZ	0.9309	Not rejected	No cointegration
l_IR_SK / l_LO_SK	0.2045	Not rejected	No cointegration
l_LO_SK / l_IR_SK	0.4306	Not rejected	No cointegration
l_IR_PL / l_LO_PL	0.3132	Not rejected	No cointegration
l_LO_PL / l_IR_PL	0.9176	Not rejected	No cointegration
l_IR_HU / l_LO_HU	0.4181	Not rejected	No cointegration
l_LO_HU / l_IR_HU	0.6561	Not rejected	No cointegration

Source: Kalibánová (2022)

The findings of our tests affirm that the scrutinized time series are not cointegrated, meaning that no long-term relationships exist among them. Given the outcomes of the ADF test and the Engle-Granger cointegration test, we have moved forward to explore potential short-term causal relationships through Granger causality testing.

4.3 The Granger Causality Test

When testing for Granger causality, just as for cointegration, we must also test the variables' effect in both directions. Consequently, we have performed the Granger causality test on all dependent and independent variables, considering both directions, as depicted in Tables 9 and 10. Concerning the results, we are only interested in p-values lower than 0.05 (i.e., 0.01 (***), 0.05 (**)) but not 0.1 (*).

Table 8 The results of the Engle-Granger cointegration test for loans and GDP

Time series	p – value	H_0 *	Evaluation of EG test results
l_LO_CZ / l_GDP_CZ	0.6679	Not rejected	No cointegration
l_GDP_CZ / l_LO_CZ	0.7335	Not rejected	No cointegration
l_LO_SK / l_GDP_SK	0.3411	Not rejected	No cointegration
l_GDP_SK / l_LO_SK	0.1047	Not rejected	No cointegration
l_LO_PL / l_GDP_PL	0.4311	Not rejected	No cointegration
l_GDP_PL / l_LO_PL	0.7492	Not rejected	No cointegration
l_LO_HU / l_GDP_HU	0.6841	Not rejected	No cointegration
l_GDP_HU / l_LO_HU	0.9473	Not rejected	No cointegration

Source: Kalibánová (2022)

4.4 Research Results

We used these analyses to investigate the effectiveness of the credit channel of the monetary policy transmission mechanism. To determine how the transmission mechanism's credit channel operates in the V4 countries, we examined long- and short-term relationships between the interest rates of the central banks in question and loans as well as between loans and GDP in the V4 countries. Based on these tests, we did not find any long-term relationships between the selected central banks' interest rates and loans or for loans and GDP in these countries. Using Granger causality, we confirmed only short-term relationships—in all the V4 countries, both for the central banks' interest rates and loans as well as for loans and GDP. Neither the theoretical basis nor empirical studies on the given issue presented a clear-cut consensus, even though we worked with an extensive survey of academic literature (for more, see Sect. 2). These empirical results were in agreement for all V4 countries, even though three of these countries have an autonomous monetary policy (the Czech Republic, Poland, and Hungary), while Slovakia implements its monetary policy via the ECB. Our conclusions thus do not contain proof that the transmission mechanism's credit channel has a clear-cut effect. Therefore, we have come to a conclusion similar to that of Nenovsky and Hristov (1999), Izak (1998), Reichel et al. (2019), Sarajevs (2000), Anagnostou and Gajewski (2019), Chmielewski et al. (2020), Dovciak (1999), Oros and Romocea-Turcu (2009), and Ganev et al. (2002). The reason why the transmission mechanism's credit channel was not decidedly effective could be that all these central banks used unconventional monetary policy tools in the wake of the financial crisis. The CNB implemented unconventional monetary policy when it began foreign exchange intervention, which it did between 2013 and 2017. The PNB similarly implemented foreign exchange intervention between 2010 and 2012. The ECB agreed to a zero interest rate in 2011, and, influenced by deflationary pressures, it took the unprecedented step of decreasing it further so that it entered negative numbers in June of 2014. Despite this, there was still a risk of deflation, so the ECB began quantitative easing at the beginning of 2015. The situation in Hungary is very specific, because the MNB is known for its unconventional monetary policy. Yet despite growing

Table 9 The results of the Granger Causality test for interest rates and loans

	d_l_IR_CZ / d_l_LO_CZ			*d_l_LO_CZ / d_l_IR_CZ*		
Order of lag	*p*-value		H_0	*p*-value		H_0
1	0.0001	***	**Rejected**	**0.0001**	***	**Rejected**
2	0.9863		Not rejected	0.4830		Not rejected
3	**0.0267**	**	**Rejected**	0.9754		Not rejected
4	0.1214		Not rejected	0.5368		Not rejected
5	0.7312		Not rejected	0.6541		Not rejected
6	0.5101		Not rejected	0.6960		Not rejected
Order of lag	*d_l_IR_SK / d_l_LO_SK*			*d_l_LO_SK / d_l_IR_SK*		
	p-value		H_0	*p*-value		H_0
1	**0.0008**	***	**Rejected**	**0.0004**	***	**Rejected**
2	0.4513		Not rejected	0.7579		Not rejected
3	0.5416		Not rejected	0.8375		Not rejected
4	0.7490		Not rejected	**0.0009**	***	**Rejected**
5	0.1674		Not rejected	0.9077		Not rejected
6	0.1844		Not rejected	0.9741		Not rejected
Order of lag	*d_l_IR_PL / d_l_LO_PL*			*d_l_LO_PL / d_l_IR_PL*		
	p-value		H_0	*p*-value		H_0
1	**0.0008**	***	**Rejected**	**0.0004**	***	**Rejected**
2	0.4513		Not rejected	0.7579		Not rejected
3	0.5416		Not rejected	0.8375		Not rejected
4	0.7490		Not rejected	**0.0009**	***	**Rejected**
5	0.1674		Not rejected	0.2819		Not rejected
6	0.1844		Not rejected	0.7131		Not rejected
Order of lag	*d_l_IR_HU / d_l_LO_HU*			*d_l_LO_HU / d_l_IR_HU*		
	p-value		H_0	*p*-value		H_0
1	**0.0038**	***	**Rejected**	**0.0006**	***	**Rejected**
2	0.2291		Not rejected	0.2960		Not rejected
3	0.2100		Not rejected	0.4885		Not rejected
4	0.1333		Not rejected	0.2225		Not rejected
5	0.1378		Not rejected	0.7104		Not rejected
6	**0.0009**	***	**Rejected**	0.3359		Not rejected

Source: Kalibánová (2022)

inflation in 2018, the MNB refused to raise its key interest rate. Since May of 2016, it has kept this at a record low level of 0.9%, whereas other countries have preferred to increase rates. Increasing rates is naturally an unpopular step, which most governments prefer to avoid. The degree of the central bank's independence then determines further development. Since Viktor Orban's return to power in 2010, the MNB's credibility has decreased, and there is widespread suspicion that its decisions are being dictated by the office of the prime minister. Despite these conclusions, monetary policy does contribute to positive and stable worldwide economic development in its role as a component of countries' economic policy—not only in the V4 countries, but also elsewhere in the world.

Table 10 The results of the Granger Causality test for loans and GDP

	d_l_LO_CZ / d_l_GDP_CZ			*d_l_GDP_CZ / d_l_LO_CZ*		
Order of lag	*p*-value		H_0	*p*-value		H_0
1	**0.0023**	***	**Rejected**	**0.00004**	***	**Rejected**
2	0.4651		Not rejected	0.8586		Not rejected
3	0.3360		Not rejected	**0.0376**	**	**Rejected**
4	0.5888		Not rejected	0.1512		Not rejected
5	0.6242		Not rejected	0.5879		Not rejected
6	0.5962		Not rejected	0.7278		Not rejected
Order of lag	*d_l_LO_SK / d_l_GDP_SK*			*d_l_GDP_SK / d_l_LO_SK*		
	p-value		H_0	*p*-value		H_0
1	**0.0006**	***	**Rejected**	**0.0006**	***	**Rejected**
2	**0.0068**	***	**Rejected**	0.6246		Not rejected
3	**0.0011**	***	**Rejected**	0.8862		Not rejected
4	**0.0482**	**	**Rejected**	0.9888		Not rejected
5	0.8547		Not rejected	0.9077		Not rejected
6	0.8492		Not rejected	0.9741		Not rejected
Order of lag	*d_l_LO_PL / d_l_GDP_PL*			*d_l_GDP_PL / d_l_LO_PL*		
	p-value		H_0	*p*-value		H_0
1	**0.0058**	***	**Rejected**	**0.0006**	***	**Rejected**
2	0.0815	*	Not rejected	0.2903		Not rejected
3	0.8094		Not rejected	0.6964		Not rejected
4	0.7472		Not rejected	0.7060		Not rejected
5	0.2768		Not rejected	0.1680		Not rejected
6	0.8729		Not rejected	0.2324		Not rejected
Order of lag	*d_l_LO_HU / d_l_GDP_HU*			*d_l_GDP_HU / d_l_LO_HU*		
	p-value		H_0	*p*-value		H_0
1	0.0019	***	**Rejected**	**0.0013**	***	**Rejected**
2	0.3707		Not rejected	0.2848		Not rejected
3	0.9467		Not rejected	0.2040		Not rejected
4	0.7194		Not rejected	0.0632	*	Not rejected
5	0.4283		Not rejected	0.1588		Not rejected
6	0.1075		Not rejected	**0.0128**	**	**Rejected**

Source: Kalibánová (2022)

5 Conclusion

In this current age of turbulence, it is clear that recent years have seen the emergence of a whole range of factors that are fundamentally and unpredictably influencing economic development and central banks' ability to meet their monetary policy goals. Therefore, when faced with economic shocks such as the financial crisis or the COVID-19 pandemic, central banks have been implementing monetary policy via unconventional tools, which makes it very difficult to predict the effectiveness of these tools. Certain economists have warned about the fact that

unconventional monetary policy can be considered an unprecedented experiment, in which only a longer period of time makes it possible to evaluate the economic impact it has on an individual economy or even the global economy. Seeing as we did not establish that the transmission mechanism's credit channel had any long-term effects, but only short-term ones, it is clear that other factors also influence the transmission mechanism's effectiveness and thus also monetary policy's effectiveness. Because the transmission mechanism operates through multiple channels, multiple factors enter in to the transmission mechanism process itself—ones which primarily appear in economies hit with a crisis. It is clear that economies are constantly developing and must adapt to new conditions, examples of this being the V4 countries' economic transformation, the creation of the European Union, the worldwide financial crisis, the COVID-19 pandemic, and the current military conflict in the Ukraine.

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The Impact of Unconventional Monetary Policy on Economic Activity: Evidence from Europe



Maciej Bolisega

Abstract The aim of conducted research was to analyze the impact of unconventional monetary policy run by the European Central Bank following global financial crisis. The research comprises period between 2009 and 2021. The main aim in this study was to evaluate the real economic impact, measured by real gross domestic product, in response to change of selected monetary policy parameters. The study used vector error correction model (VECM) and impulse response function (IRF) to simulate economic activity change in the euro area in response to monetary policy shock defined as large scale asset purchase program carried out by the European Central Bank. In order to develop VECM model, the study considered variables illustrating dynamics in economic activity, inflation, polity rates, term spread, exchange rate, and monetary policy measures. The results provided evidence that unconventional monetary policy conducted by the European Central Bank had a positive influence on economic activity in the euro area. The course of the impulse response function described that the impact was rising quarter by quarter and reached the top in the fifth quarter after the shock had taken place. In the following period the impact declined but remained positive through entire simulated period.

Keywords European Central Bank · Monetary policy · Quantitative easing · Unconventional monetary policy

1 Introduction

The implementation of unconventional monetary policies within the Eurozone has sparked considerable interest within the academic sphere. Traditionally, central banks have relied on conventional tools such as interest rate adjustments to

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influence economic conditions. However, since the global financial crisis of 2008, central banks, including the European Central Bank (ECB), have ventured into unconventional monetary policies to address economic challenges that were not effectively mitigated by traditional methods.

Unconventional monetary policies encompass a range of measures that deviate from the standard toolkit, including quantitative easing, negative interest rates, forward guidance, and asset purchase programs. These unconventional approaches raise several intriguing academic questions. They challenge conventional economic theories and models, prompting to reevaluate the mechanisms through which monetary policy affects various economic variables. The effectiveness, transmission channels, and unintended consequences of these policies have spurred rigorous analysis and debate among economists.

A review of studies published to date indicates that the impact of expansionary monetary policy in form of large-scale buying financial assets is relatively well studied in terms of effects achieved on financial market, i.e., lowering yields on long-maturity bonds or reducing the so-called *term spread*. Nevertheless, studies of the monetary policy impact on real economy, especially in the eurozone economy, are still insufficient.

Empirical investigations into the effects of central bank's QE on economic growth reveal nuanced outcomes. Pardal (2020) employed similar method to present research to analyze the impact of an asset purchase shocks in main macroeconomic indicators, such as output and prices. His study was also focused on financial markets indicators, such as bond yields and stock prices. The research covered post-global financial crisis period only. The present research covers both global financial crisis impactions and period of COVID-19 pandemic. In addition to this it also uses error correction mechanism rather than standard vector autoregression. Research by Smith (2019) employed a structural vector autoregression (SVAR) framework and finds evidence of a positive correlation between QE announcements and subsequent increases in economic activity, particularly in the manufacturing sector. This positive impact was attributed to lower interest rates, reduced corporate borrowing costs, and improved credit availability. Lee (2021) using Bayesian methods found that QE program unambiguously benefited all households by stimulating economic activity. However, it had non-linear distributional effects.

In contrast, a study by Horst and Neyer (2020) adopted a macroeconomic model and highlights potential downsides of QE and find that increasing excess reserves have no or even a contractionary impact on bank loan supply. Most of the research so far has been focused predominantly on financial instruments (Urbschat & Watzka, 2020). The present research directs its focus towards the tangible dynamics of the real economy and active economic processes in the eurozone. Additionally, this study delves into aggregated metrics that encompass comprehensive economic activities.

Findings in the study confirm that monetary policy shock has a positive and lasting impact on economic activity. The activity in the study was expressed as change in real gross domestic product. The impact of central bank's asset purchases affects

real economic activity the most after approximately five quarters and the impact slightly weakens in subsequent quarters.

The subsequent examination comprises six sections. After the introduction, the research encompasses a literature review. This is succeeded by a depiction of asset purchases carried out by the ECB. The "Data and Methodology" segment concentrates on the theoretical underpinnings and economic aggregates examined in the study. The "VECM Model" section entails a quantitative analysis targeting the economic responses to monetary shocks. This section incorporates an illustrative presentation of the impulse response function (IRF), crafted using a vector autoregression model with an error correction mechanism. The entire analysis is succinctly recapped in a summary and findings section. In the discussion segment, the principal discoveries are juxtaposed with the existing body of literature.

2 Literature Review

The size of involved financial resources provokes a question of whether monetary policy conducted in this way had intended effect. It is also very important to answer the question of how and after what time real economy responds to monetary impulses of unconventional monetary policy. Recent research on the impact of expansionary monetary policy in the form of central bank asset purchases focuses on effects to financial markets. A review of the literature shows that there is also academic research on the effects identified in real economic activity or price level. Most of these studies, however, focus on the US economy. They prove that quantitative easing policies have positive effects. Chung et al. (2012) using the FRB/US econometric model estimated that buying and holding a large value of securities on the Fed's balance sheet had a positive effect on labor market in the United States. Authors estimated that between 2008 and 2012, unemployment rate was reduced by 1.5 percentage points due to these actions. At the same time, it was found that asset purchases had a positive impact on price level by preventing deflation in the US economy. In case of long-term yields, authors estimate that 10-year bond yields were reduced by about 15 basis points. In contrast, Gagnon et al. (2011) estimated that the asset purchase program in the first stage led to term spread narrowing. Particularly yields of financial instruments with a maturity of 10 years were reduced by 30–100 basis points. The largest effect was observed on mortgage-backed instruments. FOMC Chairman B. Bernanke, in a speech to Congress in 2011, stated that the reduction in long-term interest rates achieved through the LSAP program at the time was the equivalent of a 40–120 basis point reduction in the benchmark rate. Research by Liu et al. (2018) confirmed these estimates. Using VAR model, authors also estimated that asset purchase program lowered unemployment rate by 0.6 percentage points and raised inflation rate by 1 percentage point.

The paper by Curdia et al. (2012) presented results of DSGE model estimation and effects of the second edition of the LSAP (QE) program in US economy. Authors estimate that QE2 program helped lowering long-term interest rates,

expressed as the interest rate on 10-year US Treasury bonds, by about 25 basis points. Effects in real economy were described as moderate. QE2 program was estimated to have accelerated economic growth by about 0.4 percentage points, and the program's impact on GDP acceleration had been still evident 6 years after the program's announcement. Inflation, in the simulation carried out, increased by only 0.05 percentage points.

International Monetary Fund (IMF, 2015) noted that the asset purchase programs had an immediately effect following the announcement of intention to carry out purchases. Actual transactions associated with the announcement however did not trigger such significant changes. This demonstrates the significant changes that are taking place on financial markets. Information regarding planned actions is a sufficient factor influencing market pricing and its effect outweighs the effects obtained directly as a result of actions themselves. IMF estimates that first two asset-buying programs in the United States resulted in a 50–80 basis point drop in yields on 10-year government bonds within 2 years of program's introduction. In Europe, mere announcement of purchase program made by President Draghi at a symposium in Jackson Hole in August 2014 triggered a drop in 10-year bond yields of 60 basis points for Germany, 100 basis points for Spain and 120 basis points for Italy. The implementation of the EAPP in the eurozone was accompanied by a drop in yields in these countries in range of 15–20 basis points.

In turn, Andrade et al. (2016) conducted a simulation to estimate the impact of an announcement of intent to buy assets on 10-year bond yields. In case of the United States, authors estimate that purchase program of 10% of GDP lowered the 10-year bond yield, depending on the phase of the LSAP program, between 45 and 75 basis points. The same simulation for the eurozone indicated that the EAPP program worth 10% of GDP lowered yield on 10-year government bonds by an average of 43 basis points. Other studies confirm that the effect of lowering long-term interest rates does occur and, depending on the methodology used to estimate the impact, it ranges from 13 to 107 basis points (Hamilton & Wu, 2012; Doh, 2010; D'Amico & King, 2013; Meyer & Bomfim, 2010; Neely, 2010; Krishnamurthy & Vissing-Jorgensen, 2015; Swanson, 2011).

3 The Course of Asset Purchase Program in the Eurozone

In response to the outbreak of the financial crisis, the European Central Bank, like other major central banks, lowered the level of interest rates and significantly increased value of refinancing operations for banking sector. Between October 2008 and May 2009, the ECB cut its benchmark rate by 325 basis points to 1%. Loosening of monetary policy was also accompanied by introduction of additional instruments to support credit policy in banking sector. These measures were necessary amid the collapse of the wholesale interbank lending market. Beginning in October 2008, both short- and long-term refinancing operations were made unlimited and at a fixed interest rate.

In addition, because of the unfolding Greek crisis in 2010, the European Central Bank took steps to contain growing turbulence on financial market. In May, the ECB launched a Securities Market Program (SMP) targeting the secondary market for eurozone member countries' debt securities.

This was the central bank's first initiative aimed directly at government bond market. Asset purchases primarily involved bonds issued by the governments of Greece, Ireland, Portugal, Spain and Italy. Country breakdown is illustrated by Table 1. Between 2010 and 2012, assets worth almost €220 billion were purchased. In September 2012, the program was terminated and replaced by OMT (Outright Monetary Transactions) program.

In January 2015 the European Central Bank announced an expansion of its existing private sector financial asset purchase programs called the Expanded Asset Purchase Program (EAPP).

Initially, the European Central Bank assumed that it would buy assets worth 60 billion euros per month between March 2015 and at least September 2016. The program consisted of purchasing non-credit institution private sector debt securities. Transactions were made both on secondary market (more than 80% of value of assets) and on primary market. Their maturity was at least 6 months and did not exceed 30 years. Assets purchases were concluded in December 2018. Details of asset allocation is described in Table 2.

Months before the outbreak of Covid-19 pandemic, as early as September 2019, the European Central Bank decided to restart the eurozone's quantitative easing program. This was a response to weakening economic growth and inflation remaining below target. No date was set for the planned end of the program.

In addition, due to the outbreak of the pandemic and expected severe recession in the Eurozone, the European Central Bank decided to start emergency asset purchases under the temporary Pandemic Emergency Purchase Program (PEPP). Initially, it was assumed that the program would be worth 750 billion euros. As a result of all described actions, the European Central Bank, at the end of 2021, held assets in a form of securities, worth almost 5 trillion euros, which represented nearly 40% of annual GDP of the entire Eurozone. The evolution of ECB balance sheet's size is described by Fig. 1.

Table 1 SMP summary with country breakdown

Issuer/Country	Nominal value	Average duration [years]
Ireland	€14.2 bn	4.6
Greece	€33.9 bn	3.6
Spain	€44.3 bn	4.1
Italy	€102.8 bn	4.5
Portugal	€22.8 bn	3.9
Total	€218.0 bn	4.3

Source: European Central Bank
Note: Data as of 31.12.2012, following program termination

Table 2 ECB asset allocation by type

Financial asset	Holder	Monthly net purchases	Total asset purchases target for Mar'15—Sep'16	Risk allocation
ABS instruments and covered bonds	ECB	€10 bn	€190 bn	ECB
Instruments issued by European institutions	ECB	€6 bn	€114 bn	ECB
Government bonds and bonds of eurozone government agencies	ECB	€4 bn	€76 bn	ECB
Government bonds and bonds of eurozone government agencies	National central banks	€40 bn	€760 bn	National central banks
Total		€60 bn	€1.14 trn	

Source: European Central Bank

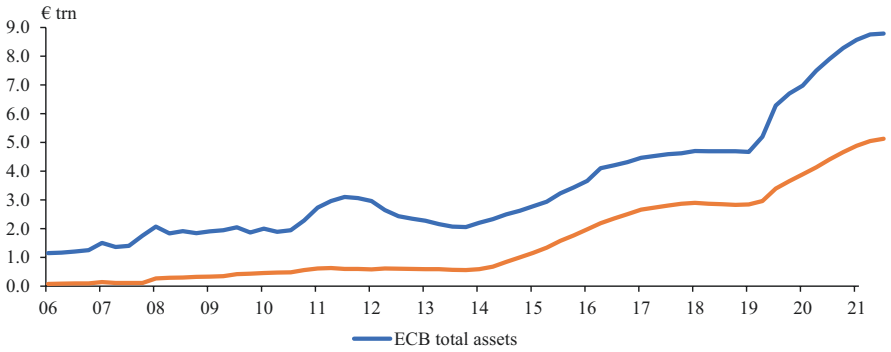


Fig. 1 ECB balance sheet. Source: European Central Bank

4 Data and Methodology

Another subject of consideration is how to assess the impact of monetary policy decisions on the real economy. In recent years, number of studies have been carried out to explain how the traditional Keynesian interest rate channel works when a dynamic stochastic general equilibrium (DSGE) model is used. Ireland (2010) points out that most of the work in this area makes use of the first attempts (Fischer, 1977; Phelps & Taylor, 1977) to combine assumptions about price and wage rigidity with rational expectations theory (Lucas, 1972; Sargent & Wallace, 1975). This developed a more detailed description of the objectives and constraints that households and businesses have in maximizing their utility functions (Ireland, 2010). The basic New Keynesian model, based on the above assumptions, consists of three equations considering three variables: output y_t; inflation π_t; and the short-term interest rate i_t. The Eq. 1 combines current output with its expected future value and

the estimated real interest rate. The real interest rate is the difference between the expected inflation rate and the nominal interest rate.

$$y_t = E_t y_{t+1} - \sigma\left(i_t - E_t \pi_{t+1}\right) \tag{1}$$

The equation of the New Keynesian Philips curve takes the form:

$$\pi_t = \beta E_t \pi_{t+1} + \gamma y_t \tag{2}$$

The Eq. 2 describes an optimal behavior of an entrepreneur under monopolistic competition, which is either confronted with specific price changes (Rotemberg, 1982) or sets its prices randomly (Calvo, 1983).

The Eq. 3 represents the rules of monetary policy regarding interest rates setting (Taylor, 1993).

$$i_t = \alpha \pi_t + \psi y_t \tag{3}$$

According to the above formula, central bank constantly adjusts the level of short-term nominal interest rates depending on the dynamics of inflation and changes in the level of output. The operation of monetary policy written in this way stems from the observation that most central banks achieve their monetary policy goals by setting a target level for short-term interest rates. The dynamics of other monetary aggregates is a consequence of the short-term interest rates setting by monetary authorities.

In the basic New Keynesian model, monetary policy is conducted through the traditional Keynesian interest rate channel. A tightening of monetary policy that leads to an increase in short-term nominal interest rates also triggers an increase in real interest rates. This is because the price adjustment process is slow. An increase in real interest rates forces households to reduce spending and, as a result, reduces business output. Then, as the Philips curve shows, lower production puts pressure on the inflation rate to slow down, which adjusts slowly after an economic shock. Another important issue is whether the monetary authorities' actions are expected or whether changes in monetary policy are unexpected in particular situation. The effects reflected by changes in macroeconomic variables may be different. The described model incorporates assumptions derived from the rational expectations model of Lucas, Sargent and Wallace emphasizing the role of expectations in the transmission mechanism. Modified formulas of the IS curve and the Philips curve were developed. They consider factors of expectations in the framework of optimizing enterprises and households' behavior. Thus, the new Keynesian model has some roots in the microeconomic basis of real business cycle theory introduced in macroeconomics by Kydland and Prescott (1982).

Obstfeld and Rogoff (1995) proposed extending the model to include open economy assumptions, in which interest rate channel operates simultaneously with exchange rate channel within the monetary policy mechanism. The authors point out that monetary policy shocks have an impact on the level of consumption, production and the so-called terms of trade. Expansionary monetary policy both at

home and abroad leads to lower global interest rates in proportion to an increase in the global money supply, and consequently to an increase in global demand. Although expansionary monetary policy increases global aggregate demand in the short term, the increase in demand in individual countries is not symmetric. An increase in a country's money supply triggers a depreciation of its exchange rate. That results in a greater share of additional consumption channeled into the market for domestic goods and services at the expense of their foreign counterparts. At the same time, domestic companies, in a situation of weakening of the national currency, improve their competitive position in foreign markets. This leads to increased production and therefore higher economic activity.

Research on the transmission mechanism of monetary policy in recent years has focused on the problem of nominal interest rates near zero. The basic New Keynesian model postulates that monetary policy affects the economy solely through the interest rate channel. According to the theory presented, households as well as businesses can use money as a form of value storage. Consequently, equilibrium in the bond market requires nominal interest rates remain non-negative. In a period of low inflation, when interest rates are very low, the central bank is constrained by the described interest rate floor. At some point, the monetary authority may find itself in a situation where it is deprived of the ability to provide additional stimulus to an economy experiencing a series of negative shocks. Accordingly, Eggertsson and Woodford (2003), Svensson (2003) and Bernanke et al. (2004) have proposed alternative strategies for conducting monetary policy in an environment of near-zero nominal interest rates.

One of the strategies proposed by Bernanke et al. (2004) is to increase the central bank's balance sheet by buying assets in the financial market. The strategy is based on the assumption that cash and other financial assets are not perfect substitutes (Meltzer, 2001; Brainard & Tobin, 1968; Tobin, 1969). Under this assumption, purchase of securities on financial market will increase the value of cash relative to non-monetary assets and induce an increase in prices of the latter. Higher asset prices and at the same time lower asset yields will have a positive effect on stimulating the economy (Andres et al., 2003). By buying and selling securities on financial market with different maturities, central bank can significantly influence the supply of these instruments on the market and their prices. When financial markets behave in an efficient manner, such action would have no effect (Bernanke et al., 2004). However, when financial markets do not function in an efficient manner, central bank's actions can affect the level of, among other things, interest rate spread (defined as a term premium) or the level of yields on individual securities.

To summarize, the basic New Keynesian model takes into account three variables: output; inflation; and short-term interest rate. However, evolving economy makes it necessary to enrich the model with additional factors, such as exchange rate, for example. The problem of low inflation, followed by very low interest rates in many countries, has caused the basic model to be extended and include additional factors referring to monetary policy. Alternative strategies for conducting monetary policy include the active use of central bank's balance sheet as a tool in this regard. When there is a turmoil on financial markets and market mechanism is not fully

effective, central bank by its actions can effectively influence yields of securities of different maturities and such actions can have a positive effect on economy experiencing adverse shocks. Therefore, when analyzing the effects of conducting monetary policy, it is reasonable to include such variables as the sum of securities held by the central bank in the modeling, as well as the term premium of interest rates.

Estimation of the model requires detailed specification of variables and representation of the time series used. Due to features of the time series that were analyzed, in many cases it was necessary to carry out a transformation of variables selected for the model. Out of the wide range of available economic indicators, the GDP was chosen as a measure of economic activity. Despite the use of quarterly data, GDP values are presented in annualized form. The unemployment rate or the level of industrial production can also serve as alternative measures of economic activity. For a measure of the price level, consumer price index (CPI) was selected. One of the central bank's primary monetary policy tools, the reference rate, was also included in the model. The data series used for the estimation, representing the reference rate, is main refinancing rate set by the ECB. The interest rate spread of instruments with long and short maturities represents the difference between the yield on 10-year government bonds and the central bank's reference rate. To illustrate the impact of monetary policy through the exchange rate channel, the exchange rate index was used. It represents a basket of currencies against the euro. The impact of the central bank's financial asset purchase program was expressed as the value of securities held by central bank relative to GDP in nominal terms during the period.

Variables included in the model are as follows:

y_t—real gross domestic product,

p_t—change in CPI core inflation,

x_t—exchange rate,

r_t—reference rate,

s_t—term-spread,

q_t—securities held by the central bank.

All the time series, excluding the reference rate and the term-spread, have been transformed to represent by the natural logarithm. The levels of the variables included in the analysis differ significantly from each other. Presentation of values by logarithm improves the reliability of the regression results. The use of natural logarithms makes it possible to eliminate the risks accompanying the performance of regression estimation on levels, thus using time series representing the values of the analyzed variables rather than their differences. Such regressions are characterized by an apparently high degree of fit of the model to the analyzed data. However, the apparent good fit of the model is due to the fact that changes in the magnitude of the variables included in the model are within a similar fluctuation range. An additional advantage of using natural logarithms is that their first differences are a very good approximation of the growth rates of the analyzed variables.

5 VECM Estimation

All the time series defined above have a quarterly frequency and cover the period from the first quarter of 2009 to the fourth quarter of 2021 and represent a total of 52 observations in a single series. Johansen cointegration test confirmed that in case of the model describing eurozone economy, number of cointegrating relationships was 3. Due to the presence of cointegrating relationships in the analyzed variables and stationarity at the level of first or second differences, the study used a vector error correction model (VECM Model). The analysis of the impact of the so-called quantitative easing of the central bank's monetary policy on economic activity was carried out. The statistical specification of the estimated model can be found in Appendix 1.

The aim of this analysis was to answer the question of how the eurozone economy responded to a monetary policy impulse. The impulse described was an external shock in the form of central bank purchases of securities. The scale of these purchases was expressed as the value of securities held in the central bank's balance sheet, recorded on the asset side, relative to the nominal GDP of the economy. The ratio was expressed in percentage points.

Figure 2 shows the course of the response function to the impulse. This is the cumulative value of the response function over the ten quarters since the shock was introduced. The reaction function in the study is a change in the level of real gross domestic product in logarithmic form. The course of the impulse response function indicates a positive effect on the value of GDP over the entire analyzed period of ten quarters. The effects, induced by the monetary impulse, gained increasing values in each quarter. The function shows that the effects of monetary stimulus, defined in this study as a large-scale asset purchase program, are most pronounced in the fifth quarter after the introduction of the stimulus. In subsequent periods, the obtained effects lose their significance slightly although they do not disappear completely.

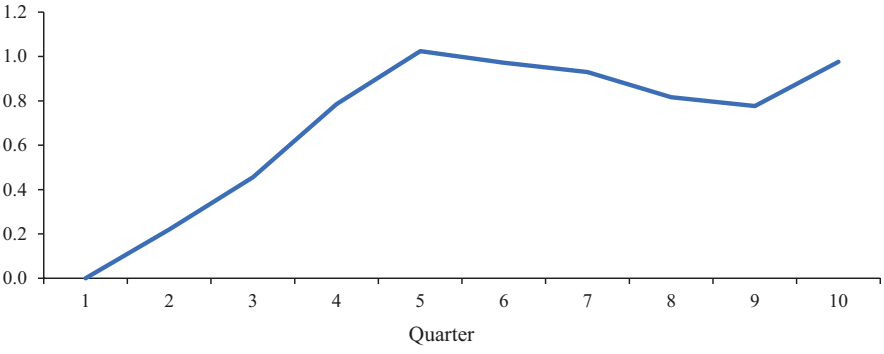


Fig. 2 Impulse Response Function (IRF), accumulated response of real GDP to ECB LSAP impulse (QE). Source: Eviews estimates

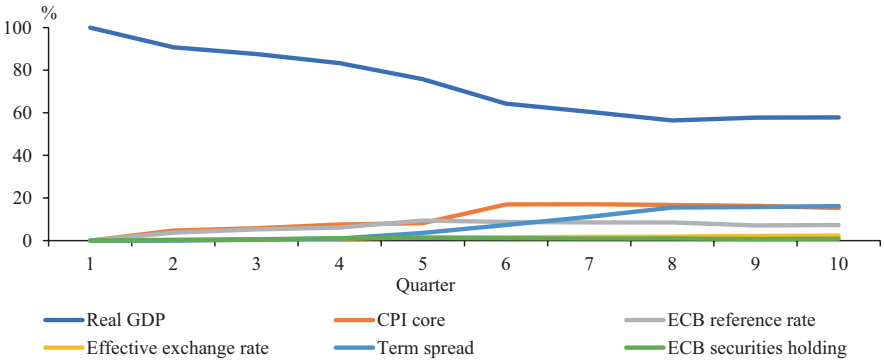


Fig. 3 Variance decomposition of GDP change. Source: Eviews estimates

The variance decomposition of the residual component of the real GDP equation, illustrated by Fig. 3, shows a very stable structure over time. The variance is explained *per se* at close to 100% in the first quarter of the simulation. In period between second and sixth quarter the share steadily decreases to a still high level of about 60% and stabilizes in subsequent quarters. During this period the share of central bank interest rates and inflation dynamics, in explaining the volatility of the residual component, increases. With a lag of about three quarters, the share of the term-spread also increases and stabilizes at the end of the analyzed period. The remaining variables have a minimal contribution to the decomposition of the variance of the equation.

6 Discussion

The analysis presented here corresponds with other studies in this area. Hohberger et al. (2019) in their study on assessing the macroeconomic effects of conducting large-scale asset purchase in the Eurozone evaluate ECB actions positively. The paper differs from this analysis in methodology and time scope. The authors use an open-economy dynamic stochastic general equilibrium (DSGE) model with Bayesian techniques in their study. The estimations are based on data from 1999 to 2018 and thus do not include the Covid-19 pandemic period as in presented research. In addition, Horst and Neyer (2020) find the impact of QE on bank loan supply may differ across countries. In consequence the impact on economic activity also varies. Authors point out that increases in the central bank's main refinancing rate as well as in the minimum reserve ratio and decreases in the central bank's deposit rate develop expansionary effects on loan supply. In addition to this the results of other authors challenge positive assessment of the ECB's unconventional monetary policy. Belke and Gros (2021), in his event study, acknowledges that the Public Sector Purchase Program (PSPP) paralleled a reduction in the risk premium and term premium on European financial markets, although these effects were temporary and vanished over several months after the program was launched. Given the size of

purchases and relatively moderate effects, measured by financial markets parameters, the author evaluates the importance of QE in the euro area as vastly exaggerated. The paper differs from described event study in variables under consideration. The presented research is focused on real economy indicators rather than financial markets as Belke and Gros (2021) paper.

7 Conclusion

Economic stimulation following financial crisis and recession usually require an active role of central bank. If monetary policy remains loose leaving interest rates at the zero lower bound, while further central bank support is still required, unconventional monetary policy have something to offer. Unconventional monetary policy in recent decade has been associated with large-scale assets purchases. This has been proven in academic literature that assets purchase program conducted by central bank has positive, quick and lasting impact on selected segments of financial markets. There has been a gap however in evidence if central bank actions, with active use of central bank balance sheet, has any influence on real economy. The question was if the impact of central bank actions' is positive or counterproductive, whether the effects are temporary or long lasting. This research gap has been identified particularly in studies focused on euro zone economy.

The aim of discussed research was to identify how large-scale asset purchases may impact real economy in case of the euro zone economy. To achieve this goal there has been a simulation developed that focused on economic activity reaction. The simulation used vector error correction model (VECM) and impulse response function (IRF). The time span of the model estimation began in first quarter of 2009, the time immediately following the outbreak of the global financial crisis and ended in the fourth quarter of 2021. The course of the IRF function illustrated that monetary policy shock had a positive and lasting impact on economic activity expressed by change in real gross domestic product. The shock in this simulation was defined as a change in value of securities held by central bank that was associated with large-scale asset purchases. According to the simulation the impact of asset purchases conducted by central bank was visible in real economic activity after approximately five quarters and slightly weakened in the following quarters.

Considering euro zone experience it can be confirmed that large-scale asset purchases, also known as quantitative easing, can be considered as additional effective tool in monetary policy framework, particularly under specific economic conditions associated with recession or economic slack.

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Compliance with Ethical Standards Author declares that he has no conflicts of interest.

Appendix 1

Vector error correction estimates						
Sample: 2009Q1 2021Q4						
Cointegrating Eq:	CointEq1	CointEq2	CointEq3			
GDP_{t-1}	1.0000	0.0000	0.0000			
∂CPI_core_{t-1}	0.0000	1.0000	0.0000			
Ref $rate_{t-1}$	0.0000	0.0000	1.0000			
Exchange $rate_{t-1}$	12.9017	−0.5232	−0.7732			
	[4.7227]	[−4.5941]	[−4.7689]			
Term $spread_{t-1}$	16.7581	−0.5055	−0.0558			
	[1.1307]	[−0.8182]	[−0.0634]			
ECB sec $holding_{t-1}$	0.2249	−0.0117	−0.0177			
	[0.5213]	[−0.6551]	[−0.6931]			
C	3.5334	−0.0879	0.1995			
Error correction:	∂(GDP)	∂(∂CPI_core)	∂(ref rate)	∂(exchange rate)	∂(term spread)	∂ (ECB sec hold.)
CointEq1	−0.2683	−0.0168	−0.0048	−0.0792	−0.0116	0.3330
	[−2.8890]	[−4.4337]	[−0.4945]	[−1.1515]	[−0.6531]	[0.6342]
CointEq2	−8.5353	−0.7060	0.5647	0.8770	−0.1217	7.3050
	[−2.5050]	[−5.0554]	[1.586]	[0.3475]	[−0.1869]	[0.3792]
CointEq3	1.1678	0.2026	−0.5047	−1.5166	−0.0682	1.8636
	[0.8225]	[3.4819]	[−3.4015]	[−1.442]	[−0.2513]	[0.2322]
$\partial(GDP_{t-1})$	−0.1740	0.0362	−0.0029	−0.0166	−0.0113	−0.2967
	[−1.0117]	[5.1477]	[−0.161]	[−0.1299]	[−0.3427]	[−0.3051]
$\partial(GDP_{t-2})$	−0.04451	0.0655	−0.0038	−0.0840	0.0230	−0.2668
	[−0.2842]	[10.2178]	[−0.2339]	[−0.7244]	[0.7681]	[−0.3013]
$\partial(\partial CPI_core_{t-1})$	15.0505	−0.4438	−0.2579	1.2473	0.4927	−15.8612
	[4.7597]	[−3.4245]	[−0.7805]	[0.5325]	[0.8149]	[−0.8872]
$\partial(\partial CPI_core_{t-2})$	6.8368	−0.2479	−0.0140	1.2433	0.6705	−7.2305
	[2.2811]	[−2.0182]	[−0.0445]	[0.56]	[1.1701]	[−0.4267]
$\partial(\text{ref } rate_{t-1})$	1.7000	0.0022	0.1598	−4.2398	0.4401	7.9260
	[0.9481]	[0.0308]	[0.8526]	[−3.192]	[1.2838]	[0.7818]
$\partial(\text{ref } rate_{t-2})$	−0.7226	−0.1820	0.5813	3.3595	−0.3695	2.4174
	[−0.3126]	[−1.9222]	[2.4067]	[1.9623]	[−0.8361]	[0.185]
∂(exchange $rate_{t-1}$)	0.0649	−0.0211	0.0305	0.6713	−0.0121	−1.5912
	[0.3568]	[−2.8354]	[1.6017]	[4.9791]	[−0.3473]	[−1.5463]
∂(exchange $rate_{t-2}$)	−0.0776	0.0034	−0.0470	−0.0893	0.0511	1.4973

Vector error correction estimates						
	[−0.3985]	[0.4300]	[−2.3092]	[−0.6183]	[1.372]	[1.3591]
∂(term spread$_{t-1}$)	0.2340	−0.0093	−0.0055	−0.2428	0.4324	4.1233
	[0.2158]	[−0.2096]	[−0.0481]	[−0.3022]	[2.0854]	[0.6725]
∂(term spread$_{t-2}$)	0.2306	−0.0552	0.3639	3.9314	−0.0443	−3.5396
	[0.1824]	[−1.0665]	[2.7549]	[4.1982]	[−0.1835]	[−0.4952]
∂(ECB sec holding$_{t-1}$)	0.0042	−0.0007	−0.0079	−0.0197	0.0087	0.1567
	[0.0949]	[−0.4005]	[−1.6973]	[−0.5948]	[1.0245]	[0.6214]
∂(ECB sec holding$_{t-2}$)	0.0115	0.0017	−0.0038	−0.0525	0.0007	0.2287
	[0.2628]	[0.9738]	[−0.831]	[−1.6163]	[0.0799]	[0.923]
C	−0.0265	−0.0022	0.0352	0.0352	−0.0255	−0.6773
	[−0.0650]	[−0.1335]	[0.826]	[0.1165]	[−0.3262]	[−0.2936]
R-squared	0.5520	0.8648	0.5149	0.6909	0.3226	0.2597
Adj. R-squared	0.3653	0.8085	0.3128	0.5621	0.0404	−0.0488
Sum sq. resides	303.2431	0.5095	3.3115	166.4012	11.0855	9693.5930
S.E. equation	2.9023	0.1189	0.3033	2.1499	0.5549	16.4093
F-statistic	2.9574	15.3610	2.5477	5.3648	1.1432	0.8419
Log likelihood	−119.6304	46.4780	−2.1847	−104.0269	−33.5991	−209.7122
Akaike AIC	5.2165	−1.1722	0.6994	4.6164	1.9077	8.6812
Schwarz SC	5.8169	−0.5718	1.2998	5.2168	2.5080	9.2816
Mean dependent	0.1314	0.0125	0.0288	−0.0322	−0.0186	−0.9385
S.D. dependent	3.6431	0.2719	0.3659	3.2490	0.5665	16.0232

T-statistics of estimated coefficients are denoted by [ ]

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Is the Real Exchange Rate a Transmission Channel of the Japanese Monetary Policy? A Statistical-Mathematical Analysis



Rosa Ferrentino and Luca Vota

Abstract The recent events in Japan have brought back the debate on the effectiveness of economic policy measures taken by the authorities of that country to tackle the crisis of the Lost Decade. In this manuscript, we deal with Japanese monetary policy and, more specifically, our aim is to assess whether the real exchange rate represents a transmission channel of the monetary stimuli of the Bank of Japan. This possibility has been previously discussed by other researchers without being empirically checked. To accomplish this task, we employ a proper statistical-mathematical approach consisting of a Structural Vector Error Correction (*SVEC*) analysis. We write down and identify our model relying on the Monetary Approach to the Balance of Payments, and then we estimate it through quarterly time series data in the sample period Q1 1994 – Q1 2022. Our results indicate that, contrary to what has been suggested by the established literature, the real exchange rate is a relevant transmission channel of Japanese monetary policy only in the short-run. We discuss the policy implications arising from this outcome.

Keywords Japanese monetary policy · Real exchange rate · Crisis of the lost decade · Monetary approach to the balance of payments · Quantitative methods in economics

1 Introduction

The long period of expansion of the Japanese economy that began after World War II was abruptly interrupted in 1991 and the country entered a new phase characterised by low per capita GDP growth and deflation (the crisis of the Lost Decade). The reasons for Japan's sudden and profound decline are the subject of a wide academic

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debate. Many economists include, among the main causes, the bursting of the *baburu keiki*, which is the speculative bubble formed in 1986 because of the massive investments of Japanese companies in the stock market and in the real estate sector. In fact, according to the proponents of this thesis, the policies of financial deregulation and the liberalisation of capital movements in the 1980s entailed an increase in the liquidity available to Japanese firms and led them to invest in the stock market and real estate sector (Fletcher III, 2012). Moreover, Japanese private banks proved to be unable to cover the default risk coming from the collapse of the speculative bubble, because of their low profitability and massive stock investments. Consequently, despite the huge injection of money by the government into the financial system, many banks became "zombie banks", namely accumulated a large amount of bad loans and were forced to downsize their lending activity (Fukao, 2003).

Some researchers believe that the worsening and persistence of the crisis of the Lost Decade is due to the monetary policy of the Bank of Japan (Bernanke, 2000, 2003; Blanchard, 2000; Krugman, 1998, 2000), but this idea is only partially supported by the empirical evidence in the literature. In fact, based on results provided by Leigh (2010), the Bank of Japan did not effectively counteract the adverse shocks that hit the Japanese economy in the early 1990s, because it adopted a too low inflation target and set its monetary policy on the basis of a conventional policy rule that was not aggressive enough . Again, according to Leigh, an inflation target of 4% per year and a stronger response to the output gap would have improved the performance of the Japanese economy in terms of GDP growth and prevented the problem of the zero lower bound of nominal interest rates. Furthermore, Eggertsson (2003) pointed out that, between 1998 and 2003, the fiscal financing of public expenditure has been so large as to double the monetary base and that the real reason for the ineffectiveness of Japanese monetisation of the government expenditure policy is the poor coordination between Treasury officials and the board of the Bank of Japan. In fact, if there had been greater cooperation between these two parties, the inflation expectations of the private sector would have been such as to promote output growth.

Other contributions on the determinants of the crisis of the Lost Decade focused on factors such as the gradual decline in domestic demand, namely private fixed investment and household consumption (Horioka, 2006), the local governments' overreliance on transfers from the central government and adoption of Basel rules (Yoshino & Taghizadeh-Hesary, 2015), the ageing of the working age population (Aoki, 2012) and the low Total Factor Productivity (TFP) growth rate (Hayashi & Prescott, 2002).

Relying on the recommendations provided by Krugman, Bernanke and Blanchard in the contributions cited above, between 2001 and 2006 the Bank of Japan undertook the Quantitative easing (QE) that is an expansionary monetary policy program aimed at stimulating inflation and GDP growth and consisting of the purchase of government bonds, asset-backed securities, equities, and commercial papers amounting to three hundred billion USD. As part of this programme, the Bank of Japan decided to address the zero lower bound issue by replacing its traditional policy instrument, the nominal interest rate, with the current account balances held by commercial banks. Evidence for QE suggests that it reduced short-term and

medium-term interest spreads by facilitating access to the credit market and investment (Fujiwara, 2004; Honda, 2014), which increased stock prices and improved market expectations (Honda et al., 2013; Tsuji & McMillan, 2016), while its effects on inflation and GDP growth rate were modest and only temporary (Girardin & Moussa, 2011; Schenkelberg & Watzka, 2013; Ijiri, 2016).

After recognising the poor performance of the QE, in 2013, the Bank of Japan launched the Quantitative and Qualitative easing (QQE), a new open market purchasing programme accompanied by a negative interest rate policy (NIRP) and forward guidance. Achieving a satisfactory assessment of QQE is rather complicated, as this unconventional monetary policy operation is part of the broader economic policy plan conceived by the Abe government in 2011 (Abenomics). Indeed, evidence for QQE is mixed (Ferreira-Lopes et al., 2022). Some contributions indicate that, overall, it has proved to be effective in stimulating both inflation and real GDP growth (Ferrentino & Vota, 2021; Matsuki et al., 2015; Wang, 2021), while others point out that the expansion of the Bank of Japan balance sheet and forward guidance did not have a significant impact on the same two variables (Filardo & Hofmann, 2014; De Michelis & Iacovello, 2016; Ferrentino & Vota, 2019; Koeda, 2019). The impact of the QQE on the sustainability of Japanese public debt is more uncertain. Indeed, on the one hand, QQE has contributed to improving the sustainability of Japanese public debt through its effects on Japanese government bond yields and prices (Hattori, 2020). On the other hand, the NIRP made national financial activities unprofitable and so caused a capital outflow from Japan to the stock markets of other Asian countries (Fukuda, 2018). As concerns the effects of the QQE on the stock market, they appear to be similar to those of the QE in 2001 (Lima et al., 2016).

Finally, in 2020, the Bank of Japan decided to inject new liquidity into the Japanese economy to contrast the negative impact of the Sars-Cov-2 pandemic through a purchasing program of government bonds, commercial papers, corporate bonds, and special funds-supplying operations aimed at companies and financial institutions. However, an overall assessment of the effects of these new extraordinary economic policy measures on the GDP growth rate and inflation is still premature.

The literature on Japanese monetary policy summarised above provides many research cues, due to the fact that a proper appraisal of its macroeconomic performance requires exploring all the possible transmission channels exploited by the Bank of Japan to propagate the effects of its policy decisions through the economy. In this regard, we find that the real exchange rate transmission mechanism represents an interesting research gap deserving of being filled. In fact, the purpose of our manuscript is to assess whether the real exchange rate is a transmission mechanism of Japanese monetary policy alternative to the two ones conventionally exploited by Bank of Japan, namely, agents' expectations, which are appropriately influenced by the Bank of Japan through inflation targeting and forward guidance, and the bank lending and investment channel, consisting of providing low-cost liquidity to national banks, in particular those which, after the collapse of the speculative bubble in 1989, significantly reduced their lending activity due to the accumulation of

bad loans, and stimulating public and private investment by reducing the official discount rate of the Bank of Japan.

In other words, in our contribution, we analyse the link between real money stock (M3), Real Broad Effective Exchange rate (RBEER), Balance of payments (BoP) and GDP with the aim of understanding whether an exogenous shock hitting the real money stock can positively affect Japanese GDP thanks to the consequent depreciation of the real effective exchange rate and improvement of the balance of payments.

Generally speaking, the effect of expansionary monetary policy on the real exchange rate and Balance of payments is a very debated and controversial topic. According to a line of research known as 'Monetary approach to the Balance of payments' (MBOP), the Balance of payments depends mainly on demand and supply of currency and, therefore, its surpluses and deficits can always be corrected through appropriate monetary policy interventions (Mussa, 1974; Whitman, 1975; Frenkel & Johnson, 1976; Hahn, 1977; Johnson, 1977a, 1977b). However, the MBOP has been widely criticised, both because of the assumptions on which it is based (namely pegged exchange rate, existence of a long-run full-employment equilibrium, demand of money as a stable function of income, neutrality of money, long-run convergence of price level and interest rate on the world level, money supply brought about by changes in the level of foreign exchange reserves not sterilised by the monetary authorities) are unrealistic or, in any case, are not valid for all countries, and because it is only partially supported by the empirical evidence proposed in literature (Laffer, 1972; Miller & Askin, 1972; Magee, 1976; Wilford & Zecher, 1976; Sheehey, 1980; Bilquees, 1989; Kannan, 1989; Koray & McMillin, 1999; Kim, 2001; Kavous, 2003; Ivrendi & Guloglu, 2010; Ncube & Ndou, 2013; Schaling & Kabundi, 2014; Elahi et al., 2016; Nizamani et al., 2017; Kim & Lim, 2018; Osisanwo et al., 2019).

In particular, contrary to the prescriptions of the MBOP, such evidence has found that a negative short-run monetary shock (namely a reduction in the interest rate) implies a depreciation of the real exchange rate and, in many cases, even a reduction of the trade balance (J-effect). Moreover, the delay in overshooting has been found to be relatively short and the deviation from the Uncovered Interest Parity condition is quite small. In any case, the empirical analyses under scrutiny should also be evaluated with caution as, in many cases, they are based on identification strategies that neglect the theoretical foundations of the MBOP. For example, Johannsen (1980) shows that structural equation models, which in the past have been widely used to estimate the impact of monetary shocks on the real exchange rate and balance of payments, pose serious problems of endogeneity, because they do not properly account for the MBOP theory.

In the specific case of Japan, as reported in Fig. 5 in the Appendix, since the early 2000s, the Bank of Japan has been consistently issuing currency by increasing its foreign exchange reserves in order to promote a depreciation of the exchange rate and, consequently, a stable growth of the national income and inflation. According to Orphanides and Wieland (2000), this monetary policy of the Bank of Japan is effective in stimulating both aggregate demand and inflation, supporting our expectations about the possibility that the effects of Japanese monetary policy propagate to the economy through the real exchange rate.

To accomplish our task, we rely on a Structural Vector Error Correction (*SVEC*), a model widely used in literature concerning the relationship between monetary stocks, the real exchange rate, and Balance of Payments because of its ability to account for the co-integration relationship that often exists between prices, real money stock, the national interest rate, RBEER, Balance of Payments and GDP. We write down and identify our *SVEC* through Dornbusch's overshooting model, as it is based on assumptions compatible with the MBOP; makes it possible to distinguish the long-term effects of expansionary monetary policy from those of the short term; and is consistent with the hypothesis, widely supported by evidence in the literature, of long-run money neutrality. After computing its short-run and long-run impact matrices, we use our *SVEC* to estimate a Forecast Impulse Response Function (FEIR) of the Real Broad Effective Exchange rate, interest rate, Balance of payments and GDP to a M3 monetary aggregate shock. In addition, we run a Forecast Error Variance Decomposition (FEVD) to assess the contribution of monetary policy shocks to the variability of the other considered variables.

Our research hypothesis is that, in coherence with Dornbusch's model predictions, in the short run, expansionary monetary policy (or better, a shock hitting the real money stock) can positively impact national income thanks to the depreciation of the real exchange rate, while, in the long run, this positive effect is exhausted because of the adjustment of the real exchange rate to its initial equilibrium value (Uncovered Interest Parity law).

Indeed, the innovation of our contribution is demonstrating that, in the short run, the real effective exchange rate represents a transmission channel of Japanese monetary policy other than those previously studied by researchers (namely, bank lending and agents' expectations), while, in the long-run, the positive impact on output of a depreciation of the real exchange rate is exhausted.

This manuscript is organised as follows: in Sect. 1, we provide an overview of the established literature on the effectiveness of Japanese monetary policy and point out the research aims and hypotheses, methodology, and innovative contribution of our manuscript; in Sect. 2, we propose a summary of the theoretical framework we used to identify our empirical model, namely, the Dornbusch's overshooting model with imperfect capital mobility; in Sect. 3, describe our empirical model; in Sect. 4, we outline our identification strategy; in Sect. 5, we present our results with appropriate comparisons with the previous research outputs and comments; in Sect. 6, we draw the conclusions of our analysis. Finally, we conclude the manuscript with a detailed bibliography.

2 Theoretical Background

In this Section, we propose an overview of the framework we used to identify our empirical model, namely, Dornbusch's overshooting model. Indeed, describing the short-run and long-run dynamics of interest rate, output, real money, real exchange

rate, and balance of payments is necessary to outline the identification strategy we employed in our *SVEC* model.

In particular, given the following assumptions:

I) In the long-run, the equilibrium in the goods market is given by:

$$Y = C + I + G + N_x$$

where Y is the aggregate output, I is the aggregate investment, G is the government spending and N_x is the net export.

II) The aggregate consumption is given by:

$$C = c_0 + c_1\left(1 - t\right)Y$$

where C is the aggregate consumption, c_0 is the autonomous consumption, c_1 is the marginal propension to consumption and t is the tax rate.

III) The real exchange rate is given by:

$$e_r = e\left(\frac{P^*}{P}\right)$$

where e_r is the real exchange rate, e is the nominal exchange rate, P^* is the price level of the trading partners, P is the national price level.

IV) In the long-run, the Uncovered interest Parity holds:

$$i = i^* + \Delta e_r^e$$

where i is the national interest rate, i^* is the world level interest rate and Δe_r^e is the variation of the expected real exchange rate.

V) The aggregate investment are given by:

$$I = i_0 - i_1 i + i_2 Y$$

where i_0 is the autonomous investment.

VI) The net export is given by:

$$N_x = N_0 + n_1 Y^* - n_2 Y - n_3 e_r$$

where N_0 is the autonomous net export and Y^* is the foreign aggregate output.

I) The long-run relationship between real money supply and real money demand is given by:

$$\frac{M^S}{P} = m_1 Y - m_2 \left(i - i^*\right)$$

where m_1 is the transaction coefficient and m_2 is the speculative coefficient.

II) In the long run, the money market is in equilibrium:

$$M^D = M^S$$

and:

$$M^{D^*} = M^{S^*}$$

where M^{D^*} and M^{S^*} are, respectively, the foreign real money demand and the foreign real money sypply.

The locus of the equilibria of the goods market (namely the set of combinations of *i* and *Y* that guarantees the equilibrium in the goods market); of the money market (namely the set of combinations of *i* and *Y* which guarantees the equilibrium of the money market); and of the Balance of payments (namely the set of combinations of *i* and *Y* along which the Balance of payments is in equilibrium), are given, respectively, by the IS curve:

$$i = -\frac{Y}{\left[1 - c_1\left(1 - t\right)\right]} + \frac{c_0 + i_0 + G + N_x}{i_1}$$

the *LM* curve:

$$i = \frac{m_1}{m_2} Y - \frac{M_r^S}{P} + i^*$$

and the *PB* curve:

$$i = i^* - \Delta e_r^e + N_0 + n_1 Y^* - n_2 Y$$

Graphically, the macroeconomic equilibrium of the Dornbusch overshooting model with imperfect capital mobility[1] is given by the intersection between the *IS* curve, the *LM* curve and the *BP* curve as in Fig. 1:

[1] The assumption of imperfect capital mobility is quite adequate in the case of Japan. In any case, the identification strategy we adopted is consistent with alternative hypothesis of perfect capital mobility too.

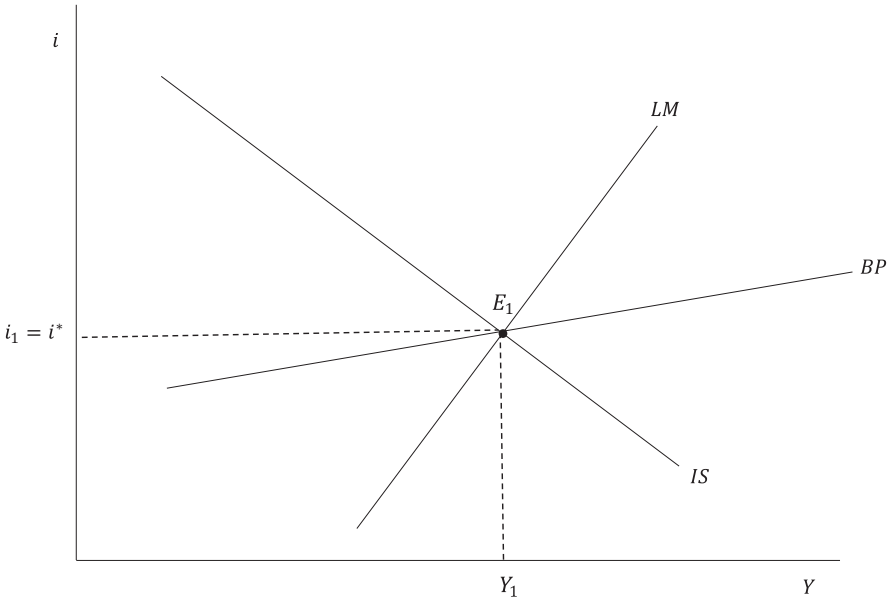


Fig. 1 Macroeconomic equilibrium in the Dornbusch model with imperfect capital mobility. Source: Authors' graphical representation based on the Dornbusch's model

where E_1 is the full employment equilibrium in which the national interest rate is equal to the world level interest rate, the market clearing conditions of the goods market and the money market are met and the Balance of payments is in equilibrium. This simple graphical representation can be used to identify the short-run and long-term equilibrium effects of expansionary monetary policy on the real exchange rate, Balance of payments and GDP. Assuming that the economy is hit by a monetary policy shock, the *LM* curve shifts downwards (from *LM* to *LM*′) and, therefore, the macroeconomic equilibrium point moves from E_1 to E_2. In E_2, the national interest rate is lower than the world level and so the real exchange rate depreciates. Consequently, net export rises and the *IS* curve shifts upwards (from *IS* to *IS*′).

Hence, the equilibrium point moves to E_3. However, in E_2 the GDP is higher than the full employment level and so prices rise, real money stock decreases (namely the *LM* curve shifts to the left in its previous position), national interest rate grows above the world level and foreign capital flows into the country.

The resulting appreciation of the real exchange rate entails a contraction of the net export and so also the *IS* curve moves back to its initial position (GDP goes down). Finally, the macroeconomic equilibrium E_1 is restored.

The entire adjustment process described above has been represented in Fig. 2:

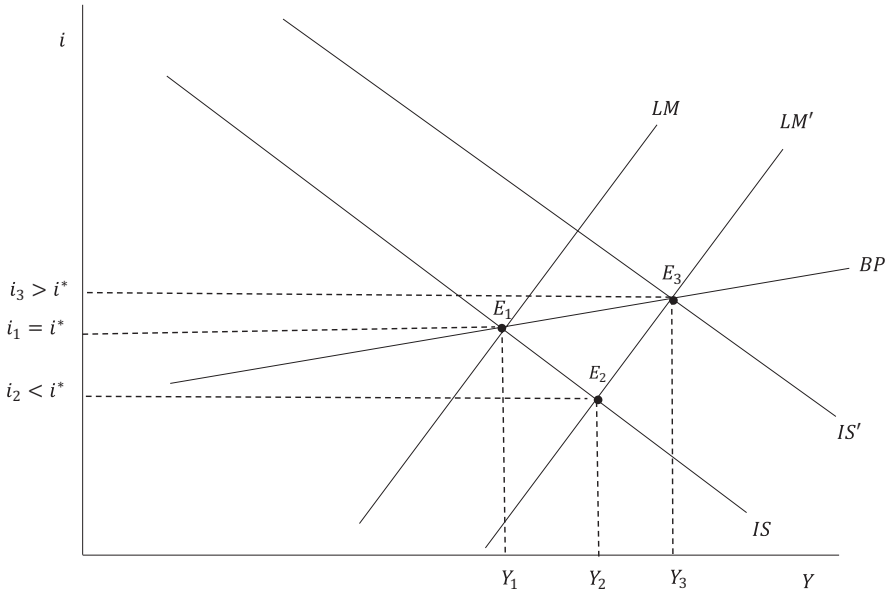


Fig. 2 Short run and long run effects of a monetary expension in the Dornbusch model with imperfect capital mobility. Source: Authors' graphical representation based on the Dornbusch's model

Figure 1 indicates the existence of the following short-run sequential causal relationship between real money stock, national interest rate, real exchange rate, Balance of Payments and GDP (from the point E_1 to the point E_2):

1) a shock to the real money stock implies a decrease in the national interest rate below the world level;
2) because of the decrease in the national interest rate, the real exchange rate depreciates;
3) the depreciation of the real exchange rate boosts the Balance of payments thanks to its impact on the net export.

The long-run sequential causal relationship between real money stock, national prices, national interest rate, real exchange rate and Balance of payments (back from point E_3 to point E_1), instead, is as follows:

4) national prices rise involving a decrease in the real money stock;
5) the reduction of the real money stock brings the national interest rate above the world level;
6) the increase in the national interest rate leads to an appreciation of the real exchange rate;
7) the country's loss of competitiveness entails a reduction in the GDP.

We use the Dornbusch framework to write down and identify our empirical model for two reasons. The first is that Dornbusch's model properly rules out the potential

feedback effects that raise endogeneity concerns by clarifying the existing relationship between real money stock, national interest rate, real exchange rate, national prices, Balance of payments and GDP. The second is the ability of the overshooting model to distinguish the short-run effects of a monetary shock from the long-run ones (which is fundamental in a *SVEC* analysis).

3 Our Empirical Model

In this Section, we analyse the relationship between nominal interest rates, national prices, M3 money stock, Real Broad Effective Exchange rate, Balance of payments, and output through the following reduced form Structural Vector Error Correction model with 1 period lag (*SVEC*(1)):

$$\Delta\xi_t = \Pi\xi_{t-1} + \Gamma\Delta\xi_{t-1} + Sx_t + \Omega\nu_t \tag{1}$$

with:

$$\xi_t = \begin{pmatrix} i_t \\ GDP_t \\ BoP_t \\ RBEER_t \\ M3_t \\ CPI_t \end{pmatrix}, \ \Pi = \alpha\beta^T = \begin{pmatrix} \pi_{11} & \pi_{12} & \pi_{13} & \pi_{14} & \pi_{15} & \pi_{16} \\ \pi_{21} & \pi_{22} & \pi_{23} & \pi_{24} & \pi_{25} & \pi_{26} \\ \pi_{31} & \pi_{32} & \pi_{33} & \pi_{34} & \pi_{35} & \pi_{36} \\ \pi_{41} & \pi_{42} & \pi_{43} & \pi_{44} & \pi_{45} & \pi_{46} \\ \pi_{51} & \pi_{52} & \pi_{53} & \pi_{54} & \pi_{55} & \pi_{56} \\ \pi_{61} & \pi_{62} & \pi_{63} & \pi_{64} & \pi_{65} & \pi_{66} \end{pmatrix},$$

$$\Gamma = \begin{pmatrix} \gamma_{11} & \gamma_{12} & \gamma_{13} & \gamma_{14} & \gamma_{15} & \gamma_{16} \\ \gamma_{21} & \gamma_{22} & \gamma_{23} & \gamma_{24} & \gamma_{25} & \gamma_{26} \\ \gamma_{31} & \gamma_{32} & \gamma_{33} & \gamma_{34} & \gamma_{35} & \gamma_{36} \\ \gamma_{41} & \gamma_{42} & \gamma_{43} & \gamma_{44} & \gamma_{45} & \gamma_{46} \\ \gamma_{51} & \gamma_{52} & \gamma_{53} & \gamma_{54} & \gamma_{55} & \gamma_{56} \\ \gamma_{61} & \gamma_{62} & \gamma_{63} & \gamma_{64} & \gamma_{65} & \gamma_{66} \end{pmatrix}, \Omega = \begin{pmatrix} \omega_{11} & \omega_{12} & \omega_{13} & \omega_{14} & \omega_{15} & \omega_{16} \\ \omega_{21} & \omega_{22} & \omega_{23} & \omega_{24} & \omega_{25} & \omega_{26} \\ \omega_{31} & \omega_{32} & \omega_{33} & \omega_{34} & \omega_{35} & \omega_{36} \\ \omega_{41} & \omega_{42} & \omega_{43} & \omega_{44} & \omega_{45} & \omega_{46} \\ \omega_{51} & \omega_{52} & \omega_{53} & \omega_{54} & \omega_{55} & \omega_{56} \\ \omega_{51} & \omega_{52} & \omega_{53} & \omega_{54} & \omega_{65} & \omega_{66} \end{pmatrix}, \ \nu_t = \begin{pmatrix} \nu_{1t} \\ \nu_{2t} \\ \nu_{3t} \\ \nu_{4t} \\ \nu_{5t} \\ \nu_{6t} \end{pmatrix}$$

where:

- ξ_t is the vector of the endogenous variables;
- Π is the matrix capturing the long-run effects on the economic system of a deviation of the endogenous variables from their equilibrium level and has a rank lower than 6;
- β contains information on the equilibrium relationships between the variables in levels;
- α is a so-called loading matrix describing the speed at which a dependent variable converges back to its equilibrium value;
- Γ is the matrix expressing the short-run dynamics;
- S is the 2×2 matrix with the unknown parameters associated to the exogenous variables;

- x_t is the 2 × 1 vector of the exogenous variables, namely the nominal foreign interest rate (the US Federal funds rate) and the foreign price level (the US Consumer Price Index);
- Ω is the non-singular matrix of the contemporaneous relationships;
- ν_t is the white noise errors vector with $E[\nu_t] = 0$ and variance-covariance matrix given by $\Sigma_\nu = \Omega^{-1}(\Omega^{-1})'$;
- $\upsilon_t = \Omega\nu_t$ is the matrix of the structural innovations with $E[\upsilon_t] = 0$ and variance-covariance matrix given by $\Sigma_\upsilon = I_\upsilon$;
- CPI_t, $M3_t$, $RBEER_t$, BoP_t, GDP_t and i_t are, respectively, the Japanese Consumer Price Index, the real M3 money stock, the Real Broad Effective Exchange rate, the real Balance of payments, the real GDP and the contractual average nominal interest rate charged on the new loans issued by the Japanese banks.[2]

We consider a *SVEC* model because, according to the Phillips-Perron test, the endogenous variables included in ξ_t are integrated of order 1 ($I(1)$) for any level of significance (1%, 5% and 10%) and the Johansen test results indicate the existence of a single co-integration relationship between the same variables. We chose the number of lag delays (namely 1) on the basis of the Bayesian information criterion.

We include the domestic variables in ξ_t and the foreign ones in S following Capistrán et al. (2019), who argue that the foreign variables are weakly exogenous as they affect the endogenous variables without being affected by the same.

Note that eq. (1) admits the following moving average representation of Beveridge-Nelson (Lutkephol & Kratzig, 2004):

$$\xi_t = F\sum_{i=1}^{t}\Omega^{-1}\upsilon_i + \sum_{j=0}^{\infty}F_j^*\,\Omega^{-1}\upsilon_{t-j} + \xi_0 \tag{2}$$

where:

- $F = \beta_\perp\left(\alpha_\perp'\left(I-\Gamma\right)\beta_\perp\right)^{-1}\alpha_\perp'$ is a matrix with rank equal to 5 (namely, the difference between the number of the endogenous variables and the cointegrating relationships);
- ξ_0 is the vector comprising the initial values of the endogenous variables;
- $F\sum_{i=1}^{t}\upsilon_i$ includes the long-run effects of shocks;
- $\sum_{j=0}^{\infty}F_j^*\upsilon_{t-j}$ is an infinite order polynomial with coefficients F_j^* going to 0 as $j \to +\infty$ representing the effects of the transitory shocks;
- $\alpha_\perp'\sum_{i=1}^{t}\upsilon_i$ represents the common driving stochastic trends;
- $\beta_\perp\left(\alpha_\perp'\left(I-\Gamma\right)\beta_\perp\right)^{-1}$ assignes the factor loadings.

[2] Time series data on M3 money stock and Balance of payments come from the database of the Bank of Japan available at the following URL: https://www.stat-search.boj.or.jp/index_en.html.

The time series data on CPI, RBEER and GDP have been drown from the database of the Federal Reserve of Saint Louis (FRED) available at the following URL: https://fred.stlouisfed.org/.

Model (2) makes it easy to estimate the long-term and short-term impact of a monetary policy shock on Real Broad Effective Exchange rate, Balance of payments and GDP through appropriate impulse response functions. However, the estimation of the model (2) requires the imposition of an adequate number of identification restrictions on the matrix of long-run effects $F_j\Omega^{-1}$ and/or the matrix of short-run effects $F_j^*\Omega^{-1}$. The identification strategy we adopt in this manuscript consists of setting an appropriate number of identifying restrictions on the matrices $F_j\Omega^{-1}$ and $F_j^*\Omega^{-1}$ based on the Dornbusch model.

4 Identification Strategy

In this Section, we outline our identification problem and the strategy we employ to solve it (which, as previously explained, relies on Dornbusch's overshooting model).

To draw the identification problem posed by the model (2), consider its reduced form Structural Vector Autoregression representation (*SVAR*):

$$\xi_t = \Phi\xi_{t-1} + Dx_t + B\varepsilon_t \tag{3}$$

with:

$$\xi_t = \begin{pmatrix} i_t \\ GDP_t \\ BoP_t \\ RBEER_t \\ M3_t \\ CPI_t \end{pmatrix}, \Phi = \begin{pmatrix} \phi_{11} & \phi_{12} & \phi_{13} & \phi_{14} & \phi_{15} & \phi_{16} \\ \phi_{21} & \phi_{22} & \phi_{23} & \phi_{24} & \phi_{25} & \phi_{26} \\ \phi_{31} & \phi_{32} & \phi_{33} & \phi_{34} & \phi_{35} & \phi_{36} \\ \phi_{41} & \phi_{42} & \phi_{43} & \phi_{44} & \phi_{45} & \phi_{46} \\ \phi_{51} & \phi_{52} & \phi_{53} & \phi_{54} & \phi_{55} & \phi_{56} \\ \phi_{61} & \phi_{62} & \phi_{63} & \phi_{64} & \phi_{65} & \phi_{66} \end{pmatrix}, B = \begin{pmatrix} b_{11} & b_{12} & b_{13} & b_{14} & b_{15} & b_{16} \\ b_{21} & b_{22} & b_{23} & b_{24} & b_{25} & b_{26} \\ b_{31} & b_{32} & b_{33} & b_{34} & b_{35} & b_{36} \\ b_{41} & b_{42} & b_{43} & b_{44} & b_{45} & b_{46} \\ b_{51} & b_{52} & b_{53} & b_{54} & b_{55} & b_{56} \\ b_{61} & b_{62} & b_{63} & b_{64} & b_{65} & b_{66} \end{pmatrix},$$

$$\varepsilon_t = \begin{pmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \\ \varepsilon_{3t} \\ \varepsilon_{4t} \\ \varepsilon_{5t} \\ \varepsilon_{6t} \end{pmatrix}$$

where:

- ξ_t is the vector of the endogenous variables;
- Φ is a matrix of unknown parameters capturing the structural relationships between the endogenous variables;
- D is a 2×2 matrix of unknown parameters expressing the relationship between endogenous and exogenous variables;

– x_t is a 2 × 1 vector of exogenous variables;
– $B\varepsilon_t = u_t \sim WN(0, \Sigma_u)$.

Note that the matrix of variance-covariance matrix of the disturbances of the model (4) is given by:

$$\Sigma_u = BB^T = \begin{pmatrix} \sigma_{11}^2 & \sigma_{12}^2 & \sigma_{13}^2 & \sigma_{14}^2 & \sigma_{15}^2 & \sigma_{16}^2 \\ \sigma_{21}^2 & \sigma_{22}^2 & \sigma_{23}^2 & \sigma_{24}^2 & \sigma_{25}^2 & \sigma_{26}^2 \\ \sigma_{31}^2 & \sigma_{32}^2 & \sigma_{33}^2 & \sigma_{34}^2 & \sigma_{35}^2 & \sigma_{35}^2 \\ \sigma_{41}^2 & \sigma_{42}^2 & \sigma_{43}^2 & \sigma_{44}^2 & \sigma_{45}^2 & \sigma_{46}^2 \\ \sigma_{51}^2 & \sigma_{52}^2 & \sigma_{53}^2 & \sigma_{54}^2 & \sigma_{55}^2 & \sigma_{56}^2 \\ \sigma_{61}^2 & \sigma_{62}^2 & \sigma_{63}^2 & \sigma_{64}^2 & \sigma_{65}^2 & \sigma_{66}^2 \end{pmatrix}$$

$$= \begin{pmatrix} b_{11} & b_{12} & b_{13} & b_{14} & b_{15} & b_{16} \\ b_{21} & b_{22} & b_{23} & b_{24} & b_{25} & b_{26} \\ b_{31} & b_{32} & b_{33} & b_{34} & b_{35} & b_{36} \\ b_{41} & b_{42} & b_{43} & b_{44} & b_{45} & b_{46} \\ b_{51} & b_{52} & b_{53} & b_{54} & b_{55} & b_{56} \\ b_{61} & b_{62} & b_{63} & b_{64} & b_{65} & b_{66} \end{pmatrix} \begin{pmatrix} b_{11} & b_{21} & b_{31} & b_{41} & b_{51} & b_{61} \\ b_{12} & b_{22} & b_{32} & b_{42} & b_{52} & b_{62} \\ b_{13} & b_{23} & b_{33} & b_{43} & b_{53} & b_{63} \\ b_{14} & b_{24} & b_{34} & b_{44} & b_{54} & b_{64} \\ b_{15} & b_{25} & b_{35} & b_{45} & b_{55} & b_{65} \\ b_{16} & b_{26} & b_{36} & b_{46} & b_{56} & b_{66} \end{pmatrix}$$

and that the corresponding linear system is made of 21 unique equations with 36 unknown parameters (namely it is unidentified).

In other words, from the algebraic point of view, the system is undetermined, that is, the unknown parameters included in the matrix B can assume infinite different values and this makes it impossible to estimate the impact of the shocks coming from the endogenous variables on the economic system.

In order to estimate the elements of the matrices $F_j\Omega^{-1}$ and $F_j^*\Omega^{-1}$, we employ the well-known *AB* model, namely we minimised the negative of the concentrated log-likelihood function:

$$\ln L_c\left(A,B\right) = -\frac{nT}{2}\ln\left(2\pi\right) + \frac{T}{2}\ln\left|A\right|^2 - \frac{T}{2}\ln\left|\mathrm{B}\right|^2 - \frac{T}{2}tr\left(A^T B^{-1T} B^{-1} A\,\Sigma_u\right)$$

where n is the number of variables entering the *SVEC* model, $B = F_j^*\Omega^{-1}$ is the matrix of the contemporaneous effects of the structural errors and $A = F\Omega^{-1}$ is the long-run impact matrix.

We estimate the matrix A by imposing 30 identifying restrictions on its 36 elements and 32 restrictions on the elements of the matrix B. This is a sufficient number of restrictions as the *AB* algorithm requires a minimum number equal to 51.[3]

[3] $n^2 + \frac{n(n-1)}{2} = 36 + 15 = 51$.

5 Results

In this section, we present the results of our *SVEC* analysis proving that the real exchange rate does not represent a relevant transmission channel of the Japanese monetary policy.[4]

We estimate the long-run and short run impact matrices of model (2) through the well-known *AB* algorithm. In both the long-run and short-run impact matrices, the zeros represent the identification restrictions set according to the Dornbusch's model, while all the other coefficients result from the estimation algorithm.

The estimated coefficients of the long-run impact matrix are reported in Table 1:

Note that the long-run impact matrix reproduces the long-run sequential causal relationship between national prices, real money stock, RBEER, Balance of payments, GDP and national interest rate postulated by the Dornbusch model and summarised at the end of the Sect. 4 of this paper. In fact, a shock to the Consumer Price Index reduces the real money stock (M3). The decrease in this variable entails an appreciation of the RBEER which, in turn, implies a contraction of the Balance of payments and, consequently, also of the GDP. Finally, the reduction in the real output rises the nominal national interest rate.

The short-run impact matrix, instead, has been put in Table 2:

As can be noted, also the estimated short-run impact matrix complies with the short-run dynamics of the overshooting model.

We use these matrices to estimate appropriate Forecast Impulse Response Functions (FEIRs) of a shock to the real money stock M3 on the national interest rate, RBEER, Balance of payments, and GDP. The forecast horizon comprises 30 quarters and then captures both short-run and long-run dynamics of the variables under scrutiny. The obtained results are reported in Fig. 3:

Table 1 Estimated long-run impact matrix of the model (2)

Variable	*Interest rate*	*GDP*	*BoP*	*RBEER*	*M3*	*CPI*
Interest rate	0.00009719	0	0	0	0	0
GDP	0.6023	1.0631	0	0	0	0
BoP	0	−0.7575	−1.037898	0	0	0
RBEER	0	0	0.001258	0.0008082	0	0
M3	0	0	0	−11.0	11.2245911	0
CPI	0	0	0	0	−0.0006696	0

Source: Authors' estimation results

Table 2 Estimated short-run impact matrix of the model (2)

Variable	*Interest rate*	*GDP*	*BoP*	*RBEER*	*M3*	*CPI*
Interest rate	0.0001420	0	0	0	0	0
GDP	0	1.195	0.3084	0	0	0
BoP	0	1.578	0.9599	0	0	0
RBEER	0	0	0.0009977	0.5578	0	0
M3	−0.2487	0	0	0	0.5200	0
CPI	0	0	0	0	0	0.9789

Source: authors' estimation results

[4] The diagnostic analysis is reported in the Appendix (see Tables 3, 4, 5 and Fig. 6).

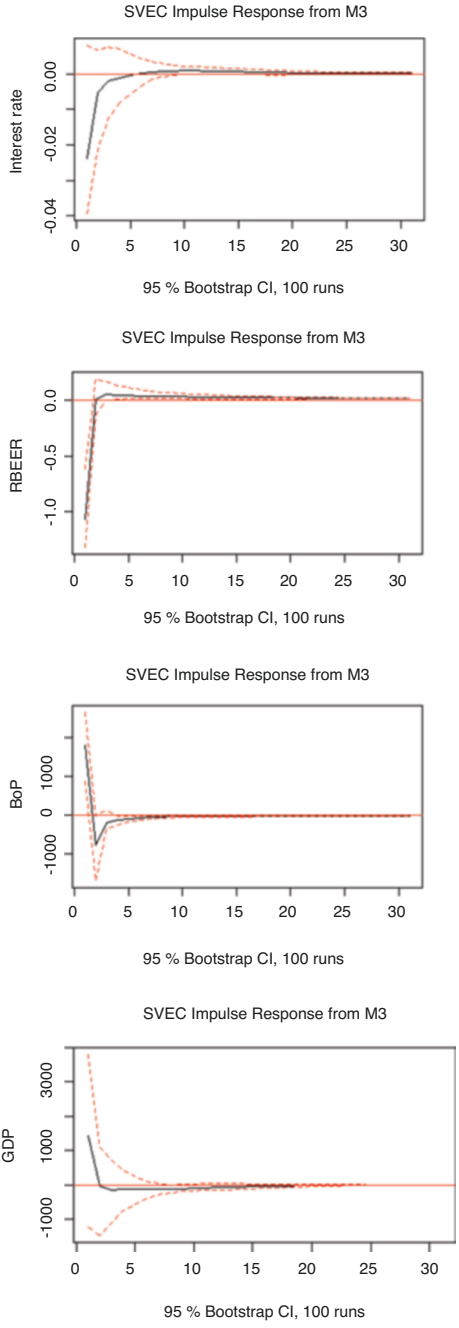


Fig. 3 Estimated FEIRs of national interest rate, RBEER, BoP and GDP to a shock to M3. Source: Authors' own study

As can be seen, the national interest rate, the Real Broad Effective Exchange rate, the Balance of payments, and the GDP respond to a shock to the M3 money stock exactly as suggested by Dornbusch's model, both in the short and long term.

As a result of a contemporary monetary shock (namely in the transition from the equilibrium point E_1 to the equilibrium point E_2 of the Dornbusch model), the nominal interest rate is reduced, the RBEER depreciates, and the balance of payments, after an initial rise, deteriorates, with a net, positive impact on output. In the long run, instead, (that is, in the transition from the equilibrium point E_2 to the initial equilibrium point E_1 of the Dornbusch model), the nominal interest rate rises, the RBEER reappreciates, the Balance of payments deteriorates and, consequently, also the GDP goes down and comes back to its initial level. It is important to observe that the RBEER responds to a monetary policy shock exactly as Dornbusch suggested, namely, contrary to the provisions of the Monetary approach to the Balance of Payments.

In fact, the monetary policy shock causes a large real exchange rate fluctuation in the short term, while, in the long run, thanks to the price adjustment (or better yet, the Uncovered Interest Parity law), the RBEER returns to its initial equilibrium level. In other words, in the long run, monetary policy is neutral, meaning that it has no effect on output or other real variables.

Overall, the results of the estimated FEIRs are in line with those previously provided for other countries, according to which an expansionary monetary policy shock favours a depreciation of the real exchange rate and a weak overshooting effect (Koray & McMillin, 1999; Kim, 2001; Kim & Lim, 2018). In this regard, it is important to observe that our findings contrast the evidence from G7 and Euro area economies (mainly produced through VAR models), according to which a contractionary monetary policy shock entails either a depreciation of the real exchange rate or a gradual appreciation of the same within the following 3 years (Sims, 1992; Eichenbaum & Evans, 1995; Kim & Roubini, 2000; Peersman & Smets, 2003; Favero & Marcellino, 2004; Mojon & Peersman, 2003). These two alternative scenarios, which have been named, respectively, 'exchange rate puzzle' and 'delayed overshooting', represent a refutation of Dornbusch's overshooting framework because both of them are inconsistent with the Uncovered Interest Parity assumption (UIP) underlying the model.

So, what is the reason for the discrepancy between our results and those contradicting Dornbusch? A possible explanation for this could be the choice of different identification strategies, in the sense that the exclusion restrictions we imposed on the coefficients of both our short-run and long-run coefficient matrices provide for no causal relationship between the real exchange rate and the real money stock and an unambiguous response of the real exchange rate to a shock hitting the real money stock, while the previously cited researchers often relied on other types of recursive, zero contemporaneous restrictions. Indeed, Bjørnland (2009) argued that a proper identification strategy should account for the simultaneity between monetary policy and exchange rate because, otherwise, numerically biased results going against

Dornbusch's predictions are obtained. Our manuscript, which counts on an identification strategy coherent with Dornbusch's standard model (which, in truth, does not involve any simultaneity between these two variables), demonstrates that this is not the case (namely, it is not true that Dornbusch's results can be reproduced only by allowing the relationship between money stock and exchange rate to be ambiguous).

However, the results in Fig. 2 also suggest that the real exchange rate is a relevant transmission channel of Japanese monetary policy only in the short run.

This is because the depreciation of the RBEER resulting from a monetary policy shock wipes out in the long-run due to the Uncovered Interest Parity law, which reverses the effects of depreciation. As a consequence, the positive impact on GDP is also limited to the short term.

To have further confirmation of this evidence, we estimate a Forecast Error Variance Decomposition (FEVD) that allows us to identify the contribution of the monetary aggregate M3 to the variability of the other five endogenous variables of the *SVEC*. The outcome is reported in Fig. 4:

The estimated FEVD indicates that the real money supply makes a significant contribution to the forecast error variance of the Balance of payments, but also that it explains only a negligible part of the changes in RBEER and GDP. Furthermore, in line with the overshooting theory, the contribution of the M3 money stock to the

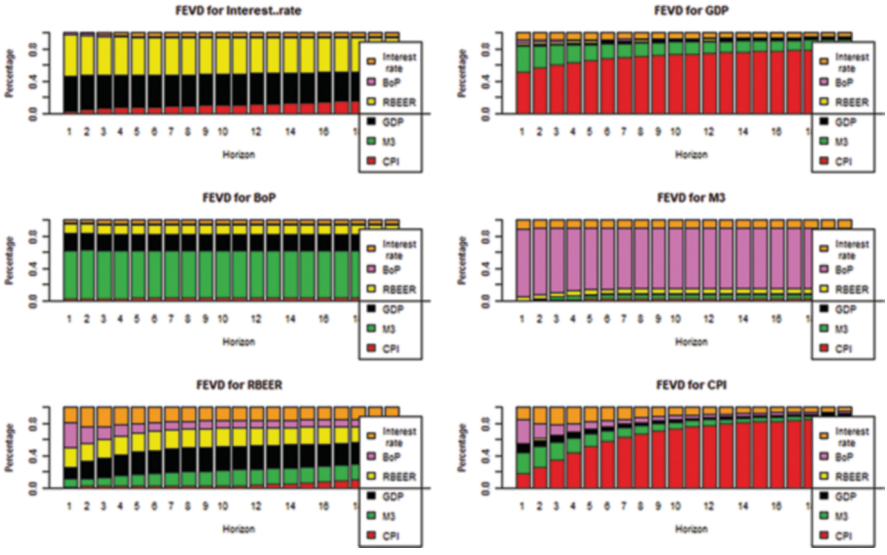


Fig. 4 Estimated FEVD of GDP, BoP, RBEER and M3. Source: authors' own study

forecast error variance of the real output is more pronounced in the short-run and decreases over time (because of the Uncovered Interest Parity law).

The main policy implication that can be inferred from our analysis is that the Bank of Japan's attempts to stimulate GDP and inflation growth by increasing its foreign exchange reserves (which results in monetary expansion and a depreciation of the real exchange rate) contribute to the rebalancing of the Balance of payments and growth of real output only in the short-run, while, the long-run impact of a monetary policy shock on the latter two variables is null.

6 Concluding Remarks

In this manuscript, we tried to understand whether the real exchange rate is a transmission channel of Japanese monetary policy, that is, whether Japanese monetary policy is capable of favouring the depreciation of the real exchange rate, and consequently, also the increase of the GDP. To accomplish this research goal, we analysed the relationship between nominal interest rates, national prices, M3 money stock, Real Broad Effective Exchange rate, Balance of payments and GDP through a Structural Vector Error Correction Model (*SVEC*).

Overall, our results are consistent with Dornbusch's theoretical model. In particular, in the short term, a monetary policy shock causes a depreciation of the real exchange rate and an increase of the GDP. In the long run, however, both the real exchange rate and the real output return to their initial equilibrium level (money neutrality).

We showed that, partially consistent with Orphanides and Wieland' insights (2000), the real exchange rate is a relevant transmission channel of Japanese monetary policy only in the short-run, as the depreciation resulting from a monetary expansion has no long-run effects on the balance of payments and output. In other words, in the long-run, the changes in the Bank of Japan's foreign exchange reserves are ineffective, that is, they do not stimulate real GDP growth.

Finally, we hope that our evidence will be useful for macroeconomists and international economists and contribute to the debate on the effectiveness of the monetary policy measures taken by the Bank of Japan to counter the crisis of the Lost Decade.

Statements and Declarations

Competing Interests The authors have no competing interests to disclose.

Funding The authors have received no financing for this research.

Ethical Standards The authors' study does not involve neither human nor animal participants.

Data Availability Statement The authors' data are publicly available on the websites of the database of the Federal Reserve of Saint Louis (FRED) and the Bank of Japan.

Competing Interests The authors have no competing interests to disclose.

Appendix

Section I

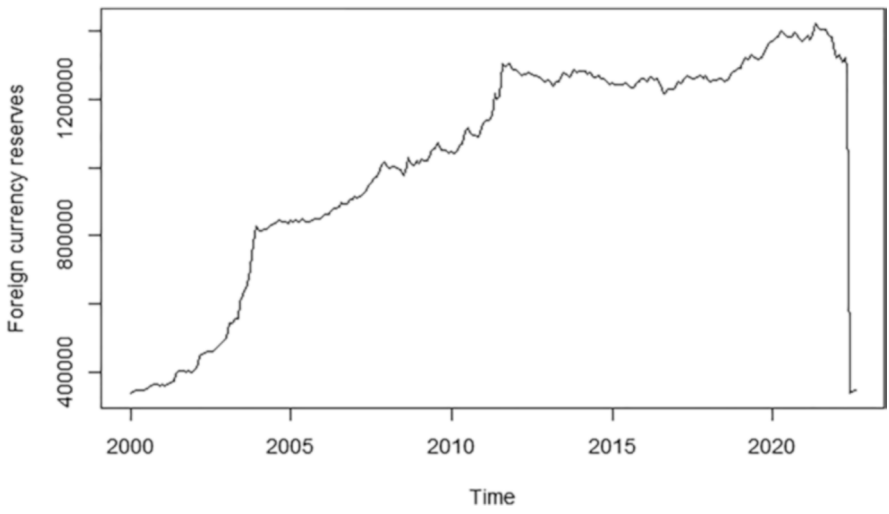


Fig. 5 Foreign currency reserves of the Bank of Japan (M1 2000–M8 2022). Source: Authors' own elaboration on BOJ data

Section II

We estimated a *SVEC* model because, as reported in Table 3 below, the Phillips-Perron test indicates that the four variables we consider are $I(1)$:

while the Johansen test, which outcome has been put in Table 4 below, suggests that they are cointegrated with cointegration rank equal to 1:

The number of lags of the model has been selected relying on the conventional information criteria, namely the Akaike one (AIC), the Schwarz one (BIC), the Hannan-Quinn one (HQC) and the Final Prediction Error one (FPE). The calculated criteria are reported in Table 5 below:

We preferred the BIC criterion as it suggests the most parsimonious specification.

We assessed the estimated model's covariance-stationarity by computing the eigenvalues of the companion coefficient matrix of the *SVEC*(1) model. Since all of them are less than 1 in modulus (0.9900001, 0.9177165, 0.7901873 and 0.2967558), the *SVEC*(1) process is covariance-stationary.

We addressed the issue of cross-correlation of the model's residuals by using the HAC standard errors.

Finally, we tested the stability of the estimated parameters through the CUSUM procedure. Figure 6 reports the relating CUSUM chart:

The estimated coefficient of each equation is stable over the entire sample period Q1 1994–Q1 2022.

Table 3 Phillips-Perron test for the null hypothesis that the endogenous variables are integrated of order 1

Variable	*Test statistic*	*p-value*
$M3_t$	0.0671957	0.9966
BoP_t	−3.00107	0.1366
$RBEER_t$	−3.16862	0.0961
GDP_t	0.0154597	0.6856
Interest rate$_t$	−3.0256	0.1181
CPI_t	0.0001789	0.9993

Source: Authors' estimation results

Table 4 Values of test statistic and p-value of the Johansen test on the endogenous variables

Cointegration rank	*Test statistic*	*p-value at 5%*
$r \leq 3$	18.54	21.07
$r \leq 2$	22.67	27.14
$r \leq 1$	37.10	33.32
$r = 0$	47.64	39.43

Source: authors' estimation results

Table 5 Estimated AIC, BIC, HQC and FPE criteria

Criterion	*Estimated value*
AIC	4
BIC	1
HQC	2
FPE	4

Source: Authors' estimation results

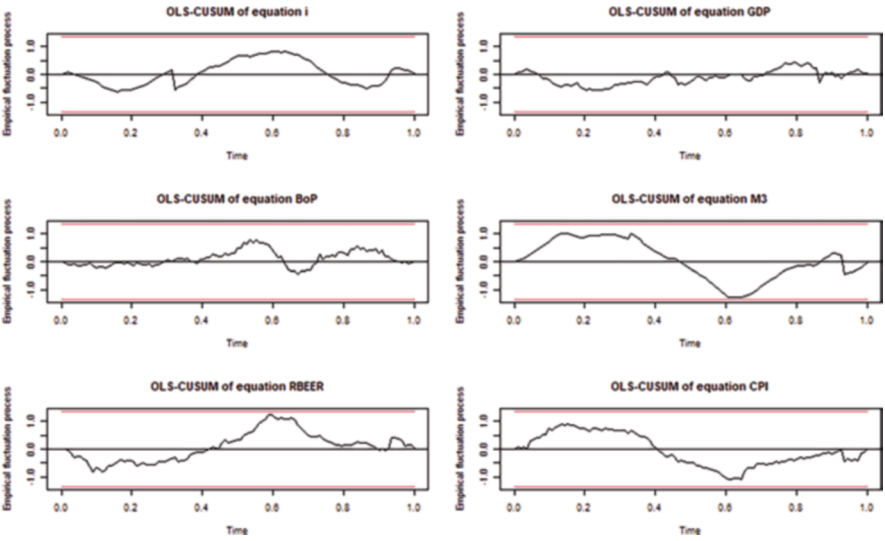


Fig. 6 CUSUM chart of the estimated *SVEC*(1) model. Source: Authors' own elaboration on FRED and BOJ data

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Financial Shocks: What Are They and How to Prevent Their Emergence



Agnieszka Wójcik-Czerniawska and Jacek Nowak

Abstract The effects of economic shocks can be felt by economies, financial markets, businesses, and individuals. In the event that the financial system of the country is suddenly and severely disrupted, serious economic crises may occur, causing high levels of market volatility and spreading an underlying state of insecurity. Throughout this paper, we examine the phenomenon of financial shocks and offer a range of strategies for preventing their occurrence in the future. Using case studies of financial shocks as well as existing literature and research, this study contributes to the body of knowledge on the management of financial shocks. Secondary research methodologies were used in this study, along with information collected from books, newspapers, articles, etc. As part of these mechanisms, social and political sustainability or progressive development is ensured, a bank culture is integrated with improved governance, business growth is stabilized, fiscal and monetary regulations are established, and dividends are limited by assisting governments with capital and dilution of shareholders. Sustainability in the financial sector is one of the most significant aspects that are currently being discussed globally, along with social issues, politics, the environment, and business.

Keywords Financial resolutions · Monetary regulatory policies · Economic prosperity · Financial recessions and depressions

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1 Introduction

Economic shocks can have a wide range of implications on economies, financial markets, businesses, and on individuals as well. There is a risk that a sudden and severe disruption of the country's financial system could lead to serious economic crises, a high degree of market volatility, and the spreading of an underlying state of insecurity within the country. Developing effective strategies to mitigate the effects of financial shocks in order to increase the resilience and stability of the economy is crucial to maintaining economic stability and resilience in the future. The purpose of the paper is to understand the concept of financial shocks, and the implications they have, and propose prevention strategies for mitigating their effects in the future. Because of the complexity of today's globalized and interconnected financial landscape, the topic of financial shocks has become of significant interest in recent years. In history, there have been many types of financial shocks, including the stock market crash, the banking crisis, the currency devaluation, and asset bubbles that have affected countries and economies throughout the world (Karanikolos et al., 2013). Shocks such as these can have severe consequences, such as economic recessions, financial institution failures, job loss, and deterioration of confidence in investors and consumers as a result of economic recessions. Hence, it is essential for policymakers, regulators, investors, and financial institutions to be able to understand the causes, characteristics, and prevention of financial shocks.

Financial sustainability is one of the most significant facets, that is gaining comprehensive discussion throughout the world, like all forms of society, politics, environment, and business are explicitly related to economic prosperity (Demsetz & Lehn, 2020). Moreover, financial sustainability opens a gateway for multidimensional development and advancement, leading to the progressive and stabilized receptacle. And as a result of these all advantages related to financial sustainability, all countries throughout the world are struggling to attain it. However, it is not an easy task to acquire, as all socio-political, socio-environmental, and socio-corporate problems directly influence economy, rendering numerous disruptions to the financial framework, which if failed to reduce, leads to financial shocks (Martin, 2011).

As a primary goal of this paper, we are attempting to explore the phenomena of financial shocks and propose a comprehensive set of strategies for preventing their emergence in the future. This study contributes to the body of knowledge on the management of financial shocks by reviewing and analyzing existing literature and research on financial shocks, as well as case studies of financial shocks in practice.

As a result of its focus on preventive measures for the prevention of financial shocks, this study stands out from the rest. The causes and consequences of financial crises have been extensively studied, and numerous studies have been conducted on these topics. However, this paper focuses on the measures which can be taken to avoid the possibility of shocks occurring in the first place, as opposed to the effects of shocks themselves. Throughout this research, we will explore preventive strategies that can be incorporated into policymaking and financial practices, in

order to reduce the chance and impact of financial shocks by providing valuable insights for policymakers and financial practitioners. This study provides a comprehensive overview of the nature and implications of financial shocks by synthesizing and analyzing existing research in the field, providing a comprehensive analysis of key findings from previous studies (Staníčková & Melecký, 2018). A number of different prevention approaches, some of which have been adopted by different countries, as well as financial institutions, are also evaluated and compared. A study can contribute to the continuing discussion around financial stability and risk management by highlighting the effectiveness of these strategies by highlighting their effectiveness.

As a methodological approach, this research uses a comprehensive literature review approach, which incorporates a number of academic research pieces, reports, and case studies from reputable sources to gather information for this study. It is clear from the findings of this study that the importance of effective regulation and risk management, early warning systems, and international cooperation cannot be overstated. It is essential to prevent the emergence of financial shocks and reduce their effects, and this research sheds light on how these requirements can be accomplished. There are several types of financial shocks that may occur in economic life, and this paper is going to look at some of their causes, consequences, and preventive measures in the subsequent sections (Fornari & Stracca, 2013). In order to illustrate the concepts discussed, we will use case studies and real-world examples from the real world. Our aim is to provide policymakers, academics, and practitioners with insights and recommendations derived from the main findings of our study so that they can navigate and overcome financial shocks as they have never experienced them before and can foster greater financial stability by addressing the challenges posed by financial shocks.

Evaluating each of these financial crises, and their emergence, we will evaluate four fundamental facets, including banking crises, currency crises, speculative bubbles, crashes, and some wider economic crises, as these four are broadly regarded as the types of financial crises (Manne, 2019). Banking crises are predominantly crashing of banks, which is caused by a panicking of investors, who take all their investments from the bank, or all deposits leading to a bank run. And as all banks lend out cash, received in the form of cash deposits, it becomes arduous for the bank to pay back all deposits if these deposits are suddenly demanded by the investors. This leads to the insolvency of the bank, and consequently, the consumers lose their deposits, as the banks are unable to customize their deposits (Heide & Simonsson, 2014). This complete phenomenon is characterized by a banking term known as systematic banking crises or banking panic (Bruneckiene et al., 2018).

The burst of a speculative bubble can result in significant negative consequences, which is why it is considered an economic crisis. Stocks, real estate, and commodities suffer from speculative bubbles when they rise rapidly and significantly above their intrinsic value, mainly due to excessive optimism, herd behavior, and speculation. An asset bubble burst can result in substantial losses for investors and broader economic disruptions when the prices of inflated assets collapse. A number of studies from leading journals support the idea that speculative bubbles are crises. It is

important to understand that financial instability and systemic risks can be caused by speculative bubbles. (Scheinkman & Xiong, 2003) obtained evidence that when speculative bubbles burst, disruptions in credit markets, bank failures, and financial distress can occur, leading to widespread economic decline. And based on this speculation, nearly all wholesalers and retailers will buy this asset, and when these all-market participants will decide to sell the product, the price will automatically fall, as supply surpasses demand. Hence, speculative bubbles are primarily associated with a sustained and substantial overriding of some specified assets (Ivlevs, 2018).

The broader economic crises, which are also called financial recessions or financial depressions, affect the national economy specifically. Economic recession is principally negative GDP growth for more than two quarters, whereas a recession lasting for more than a couple of years, is called depression. Furthermore, a rather slow-growing GDP is regarded as economic stagnation. These all collectively, if prevailed continuously, lead to a financial shock. These economic recessions are largely associated with bank runs and currency devaluation and persist as a long-term effect of this (Bhadra & Ray, 2021).

Moreover, another type of financial shock is sovereign default or debt crises, which predominantly impact the exchange rate. It emerges if the country having a fixed exchange rate undergoes a currency devaluation as a result of an account deficit, also known as currency crises or balance of payments crises. In other words, the failure of a state to pay its sovereign debt is regarded as a sovereign default. And though sometimes, currency devaluation and default can be instinctive decisions by a government, on an international level it is assumed to be an involuntary action, that is caused by a sudden stop of capital inflow or increase in capital flight (Miguel et al., 2004).

To conclude, this paper aims to explore and provide a potential prevention measure for financial shocks, as well as to explain how they occur. A primary focus of this study is prevention, which serves as a contribution to the existing literature and serves as a practical guide for stakeholders who are involved in ensuring financial stability. It will be examined in the following sections how financial shocks occur, what prevention strategies have been utilized, and what the implications of those strategies are on the global financial system as a whole.

2 Crises Management Packages

Globalization has given greater importance to economic sustainability because it is one of the most important factors in stabilizing social, political, and environmental aspects. Moreover, sustainability is a requisite in the contemporary world, which is directly related to socio-economic as well as socio-political development. All international and national organizations, governmental institutions, governments, and corporations strive towards sustainability by integrating all resources. Thus, avoiding social, political, economic, environmental, and cultural crises is crucial to achieving regional sustainability and harmony. It is essential, however, that a

management plan is executed if a crisis occurs in order to alleviate the adverse impacts of the crisis and to promote sustainability (Kalinowski, 2015).

Hence, one way to manage these crises is the crises management packages, which are highly beneficial for resolving the problems inflicted by crises. These crises management packages are defined distinctly, depending on the type of the crisis, and the type of entity using the package. Broadly, the crises management package is evaluated in terms of the organizational crises and national crises, used by the corporate executives and the federal administrators respectively (Leo et al., 2019). If the crises management packages are evaluated, in terms of the corporate resilience, it is defined as in corporate terms, a crisis management package is launched essentially by executive staff, and it centrally outlines a well-organized method to reply to a critical situation that affects the reputation, operational efficacy, sales, and profitability of a company (Kuznets, 1988). These crisis management packages, if executed efficiently, can result in dynamic governance and efficient mechanisms, that lead to stability at all levels, thereby providing a resolution to mitigate the repercussions caused by a specified crisis. There are numerous types of crisis management packages, which differ concerning the systematic operation, the strategic mechanisms, and are primarily based on the type of crisis. These crises management packages are highly beneficial, as they allow the entity implementing the package to mitigate the effects of crises, paving the path of economic progress, social advancement, and political prosperity (Abramova, 2022).

The corporate crisis management packages, ensure adherence and assimilation in an organization, allowing the business to either eliminate the crisis or lower the impact of the crisis, thereby enhancing workplace flexibility, organizational resilience, productivity, and operational efficiency. These corporate crisis management packages discuss the durability and persistence of an organization and assist a business in achieving its fundamental goals. However, the crises management packages for the resolution of the national or regional crises, are concerned with the preservation of social equilibrium in case of social crises, political stability, and regional harmony in case of political crisis, environmental sustainability in case of environmental crisis, and economic growth and financial stability in case of an economic crisis (Ryakhovskaya, 2014). These packages allow a government to sustain regional harmony and peace in the state, thereby depreciating the impact of these problems, and if these packages are executed efficiently, they can lead to principal success and the accomplishment of socio-economic and socio-political endurance. And since our research has pertained to the execution of the governmental packages introduced for the national integration of a country, therefore, the impact of these packages on consumer buying behaviour will be evaluated (Ushanov, 2015).

Though enormous crises management packages are introduced by the governments, which depend on the type of crisis, if it's an economic bankruptcy, or social disability, or political disequilibrium, or health care crises, or a natural crisis, or any other. However, among all these the economic crises are the most effective, as it collectively affects the socio-political, and socio-environmental conditions of a country. Hence, considerable importance is given to the economic crises management packages, which are commonly introduced with a specified policy to reduce

the government debt and incorporate a set of austerity measures. The crises management packages and their uses in the socio-economic and socio-political, environmental, and corporate crises. Any plan that is mostly introduced by the federal or provincial government in case of any social, political, economic, cultural, and environmental crises, as it principally outlines a strategy to respond to a critical situation, that affects the peace, stability, and regional harmony of the state. However, if considered the crises management packages, if considered in terms of the national integration is defined as in corporate terms, a crisis management package is introduced principally by executive or managerial staff, and it fundamentally outlines a systematic plan to respond to a critical situation that affects the reputation, operational efficacy, sales, and profitability of a company (Lauras et al., 2015). These crisis management packages, if implemented efficiently, can result in efficient governance and effective mechanisms, that lead to stability at all levels, thereby providing a resolution to alleviate the impact of the crisis. There are various types of crisis management packages, which differ concerning the systematic operation, the strategic mechanisms, and are primarily based on the type of crisis.

3 Crises Management Packages in Economic Shocks

An economic shock crisis management package is a complete range of policy interventions designed by governments, central banks, and international organizations to deal with unexpected and severe disruptions. Economic shocks can be mitigated, stability is restored, and recovery can be facilitated through these packages. Fiscal, monetary, and regulatory measures are typically used in combination to alleviate a shock. To stimulate economic activity and support households and businesses, fiscal stimulus measures are often implemented. In order to stabilize financial markets, encourage lending, and restore confidence, monetary policy measures include interest rate adjustments and liquidity support. Furthermore, crisis management packages may include capital injections, liquidity provisions, and regulatory reforms to improve risk management for the financial sector (Fama & Jensen, 2019). For individuals and households, social safety nets and measures to protect employees are also commonly included. The financial system can also be strengthened through regulatory reforms to address vulnerabilities. Financial assistance and policy coordination may be provided by international institutions through international cooperation and support. A crisis management package is designed to alleviate immediate difficulties and foster long-term recovery and resilience (Wunder et al., 2021).

The execution of the economic reform by the Soviet Union after the cold war. The economic reforms were introduced by the United States after the war on terror. And the austerity measures, including the Bokros Package and New Deal executed by the Hungarian government after the Great Depression. As these, all types of economic crises management packages were adopted to mitigate the economic bankruptcy and to save the financial structure from breaking own, by revitalizing the economic crisis, for instance, to alleviate the economic impact of the Great

Depression caused after World War I, or to mitigate the impact of the economic underdevelopment in Hungary by execution of Bokros package. However, these economic reforms and austerity measures are taken in these packages, which included de-centralization of the economy, more economic tariffs, tax cuts, and tax reformations, labour market reforms, corporatization and privatization of the state-owned assets, and the government offices and governmental departments, and cutting out of the government wages, or even cutting out of the government employees. And these austerity measures resulted in the considerable economic advancement of these countries, which were previously on the verge of economic breakdown, thereby stabilizing the social structure and political hierarchy (Golovanov & Kulikova, 2014). This enabled these countries to recover from financial bankruptcy. However, these economic crisis management packages supported the national economy of these countries, but destabilized the economic hierarchy of the Hungarian population, affecting the individual, social, and professional lives of the people. The tax reformations, as executed by these packages included increased taxation policy to increase the federal capital, which in turn, implicated financial stress on the people, as a principal amount of their wage was spent on the tax, which largely restrained their economic resources. Similarly, the cutting out of the wages of the government employees in Hungary, as a part of the corporatization policy, a fundamental provision of these packages largely affected the people as they destabilized the economic hierarchy of numerous families, which were somehow reliant on the government pays. In addition, the cutting off of government employees, which again was a part of the corporatization policy depreciated the economic resources of the people, and as a result of these reduced financial resources, the people limited their wants, thereby changing their buying habits and changing their consumer buying behavior (Brenner & Theodore, 2002). Moreover, the privatization and corporatization, which were the fundamental provisions of the Bokros package, affected businesses throughout the country, which affected the people, operating their businesses directly and affected the other people indirectly in numerous ways. As these businessmen suffered economic crises, they increased the prices of their services and products, which again increased the financial burden on the people. This limitation of financial resources affected all facets of civil life, affecting the mental and physical health of people as a result of increased stress and social life, as people utilized the maximum time to earn money.

Moreover, Robert and Lajtha also evaluated the benefits offered by the crises management packages, which are unique for both corporate crises and national crises. The corporate crisis management packages, assure stability and integration in an organization, allowing the company to either eliminate the crisis or lower the impact of the crisis, thereby increasing workplace flexibility, organizational resilience, productivity, and operational efficacy. These corporate crisis management packages address the survival and durability of an organization and assist an organization in achieving its fundamental objectives. However, the crises management packages that deal with the resolution of the national or regional crises, are pertained to the maintenance of social equilibrium in case of social crises, political stability, and regional harmony in case of political crisis, environmental

sustainability in case of environmental crisis, and economic growth and financial stability in case of an economic crisis (Aassve et al., 2006). These packages enable a government to endure regional harmony and peace in the state, thereby minimizing the impact of these problems, and if these packages are implemented efficiently, they can lead to substantial success and the attainment of socio-economic and socio-political stability. However, sometimes these crises management packages are not executed systematically, due to negligence or poor governance, which worsens the situation, and can have substantial disadvantages. The systematic execution and enactment of the crises management packages, as asserted by Robert and Lajtha constitutes four major provisions, which are necessary for the successful implementation of these packages (Antal, 2019). These provisions are the preparation, implementation, response, and recovery. As soon as a crisis is recognized by the government, in case of socio-economic and socio-political crises, or by corporate governance in case of organizational crises, a crises management package is prepared, that includes certain provisions to alleviate the impact of the crises, primarily for the rejuvenation of stability, and resilience. After the preparation, these packages are implemented considering the internal and external factors, on the broader level, covering all organizational facets, and all national facets collectively. After implementation, the government and the organization respectively wait for the response, which largely depends on the efficiency of the package. If the response is good, it leads to recovery, and attainment of national stability and harmony, and organizational resilience, and increased productivity. Hence, crisis management packages are significant for the achievement of sustainable development.

Financial sustainability is pivotal for the stability of the country, as an economically advanced country is socially developed and politically refined. The stronger the financial structure of a country is, the more leverage it possesses. This is evident from the power of the economically progressive countries, which not only explicitly control the regional politics but also shape the regional governance mechanisms, primarily because of the huge capital, such as the United States of America, Russia, the United Kingdom, the People's Republic of China, and others. Hence, economic prosperity is highly significant for the success of a country. However, if the economy fails, because of any crises that affect the financial system, and efficient crises management the package should be executed (Adam, 1991). And the countries which execute these efficient and productive packages only succeeded. For instance, the implementation of the New Deal by the government of the United States after the World War saved the country from financial crises. The execution of the economic reform by the Soviet Union after the cold war. The economic reforms were introduced by the United States after the war on terror. The enactment of the austerity measures by the government of the United States, and other countries after the financial crises of 2008, including the implementation of numerous fiscal programs, incorporating the Economic Stimulus Act of 2008, and the American Recovery and Reinvestment Act of 2009. And the austerity measures, including the Bokros Package and New Deal executed by the Hungarian government after the Great Depression. The primary objective of these austerity measures is to reduce the economic burden on the federal government, by reducing government spending and

public debt, thereby revitalizing the financial structure of a country. All of these packages were different, and had taken different measures, depending on the extent and type of financial crisis, nearly all of these packages consisted of microeconomic reforms, which were formulated to promote a floating currency, economic deregulation, lower tariffs, tax cuts, and tax reforms, labour market reforms, corporatization and privatization of the government offices and governmental departments, and cutting out of the government wages, or even cutting out of the government employees (Aristei & Gallo, 2021). These measures were largely beneficial for the governments of these countries, to sustain financial equilibrium and revitalize the economic stability of the country. For instance, the austerity measures executed in the form of the New Deal after World War I in the United States incorporated these all measures, and hence stabilized the economy of the country, making it again the greatest economic centre of the world (Manners, 2002).

4 Resolutions for Financial Shocks

An array of measures aimed at mitigating and resolving the effects of sudden and severe financial shocks is in place to address and address financial shocks. Affected economies are encouraged to recover through these resolutions, which aim to restore stability, rebuild confidence, and foster recovery. As a key solution, emergency liquidity provisions are provided as well as capital injections and temporary nationalizations of institutions. For the purpose of restoring solvency and improving risk management, troubled financial institutions are recapitalized and restructured. The financial sector needs regulatory reforms to improve oversight, transparency, and accountability. A fiscal stimulus package or targeted support is an economic stimulus measure designed to boost aggregate demand and stimulate the economy. Effectively addressing financial shocks requires strong financial stability mechanisms, international cooperation, and learning from the crisis through post-crisis assessments and reforms. Resolving shocks and restoring long-term financial stability depends on the nature of shocks and the financial system characteristics of each country (Pancotto et al., 2019).

Certain steps can be taken to avoid financial shocks, which can be of resolute advantages to the states. These steps incorporate assurance of socio-political sustainability or progressive development, stabilized growth of the business sector, fiscal and monetary regulatory policies, provision of an integrated bank culture with increased bank governance, and imposing restrictions on dividends by assisting the governments through the capital that dilutes shareholders. These all steps have been strategically incorporated independently in case of financial crises, and be of great significance. Hence, it has been asserted by researchers that if all these financial resolutions are executed simultaneously, it will largely assist the companies to stabilize their national economy and in preventing financial shocks (Janus & Riera-Crichton, 2015).

Evaluating the attainment of social and political sustainability, it has been implied by economists and socialists that social, political, and economic sustainability are all interrelated mechanisms, that collectively foster the advancement of a country. This is evident from the fact that States with political stability and social progression is comparatively more financially strong than States with political instability, or disrupted social structure. That's why social advancement is directly proportional to the growth in GDP, employment rate, and other economic factors. Hence, a state must bolster economic growth by fostering socio-political advancement. And this social and political advancement can be achieved by attaining social justice, equality, provision of education, and health care facilities, provision of jobs, which are correlated to social progression, and the avoidance of war, maintenance of a good relationship to the foreign countries, regional and non-regional actors, diplomatic participation in international politics, and stabilizing peace and consensus in the region are proportional to political sustainability. This political stability is specifically important for economic growth, as international communities support politically stabilized countries, during financial shock, by assisting them through the capital. Moreover, trade and investments are also largely impacted by political stability (Janus & Riera-Crichton, 2015).

The stabilized business bureau is also a contributing factor, promoting the economic growth of a country. The business cycle plays a very important role in stabilizing the economy of a country, as a business directly affects the economy. It is asserted the stronger the business of a state is, the more investors are attracted to it, and the more investors invest, the more flourishing currency is. This is evident from the fact that the states with a progressive corporate culture, are more economically progressive as compared to the states, with disrupted business structures. Hence, as a result of this direct relationship between the business and the economy, it is implied that all business techniques and corporate culture, directly influence the economy of a country. Hence, businesses must be regulated, to promote the economy and to avoid financial shocks (Adler & Tovar Mora, 2012).

Similarly, monetary or fiscal regulatory policies are one of the most significant parameters that influence economic development, leading to financial prosperity. Monetary or fiscal regulatory policies are the policies that regulate the flow of capital by the government, including government spending and tax policies, which incorporate macroeconomic factors, including the aggregate demand for various products and services, which affect inflation, employment, and financial growth. This highly affects the economy, as the government spending and the collective tariffs of a country explicitly affect the economic growth and financial development, predicting the economy of a state. These policies are primarily imposed by either the federal banks or governmental officials, and directly influence the market, as well as the market participants, which explicitly influence the economic receptacle of a state. The governments of the countries must establish integrated regulatory policies, that stabilize the economy of a country, by providing sustainable plans for financing investors, and financing market participants, in such a way that promotes economic growth and development (Alderman, 1996).

Furthermore, bank governance directly influences the economic structure of a state, on all levels of the nation and regional economy. Integrated bank governance, and regulation of bank policies, can be highly significant to the economy of a state, as the bank administers the taxation policies, government spending, and consumer economic policies. Hence, if the banking sector is administered effectively, it leads to economic stability. The banks must improvise a system to sustain the government spending to promote GDP growth and facilitate socio-political growth, which in turn leads to economic growth. Consequently, as a result of this significance of economic growth, the banking regulatory policies are primarily imposed in the national receptacle of a country, which leads to the economic prosperity of a state (Ciccone, 2011).

Similarly, some other minor factors can be highly important for the growth of an integrative economy, including the assistance of the business persons, the assistance of investors, and investment plans, facilitation of consumers, promoting of online business, and improved execution and enactment of the regulatory policies. These all steps will be highly important to promote sustained and streamlined economic growth, leading to multidimensional social advancement and political stability.

5 Conclusion

As a conclusion to this paper, we have discussed both the concept of financial shocks as well as the prevention and mitigation measures taken to prevent them from arising and minimizing their impact. The financial shock, which occurs when the financial system is suddenly disrupted and severe in a manner that can be disastrous for an economy, businesses, and individuals, can have significant consequences. Based on an analysis of the current research literature, case studies, and policies, the current study provides useful insight into the crisis management packages and resolutions for dealing with financial shocks by analyzing existing literature, case studies, and policy responses.

Financial sustainability is one of the most significant facets, that is gaining comprehensive discussion throughout the world, like all forms of society, politics, environment, and business are explicitly related to economic prosperity. Moreover, financial sustainability opens a gateway for multi-dimensional development and advancement, leading to the progressive and stabilized receptacle. Financial shocks or financial crises are characterised as multidimensional shocks to the economic system, of either a state, a province, or a region, which is characterized by a contraction in the value of asset prices, breakdown of business, impeding the states to pay their debts, as financial institutions undergo liquidity shortages, and the breakdown of the stock exchange markets. When a country or a province collectively encounters all these financial crises, it leads to financial shocks, thereby disrupting the financial structure, pushing the state economically backwards. Sometimes, a financial shock is primarily associated with a bank run, which is marked by the panic of investors, as investors understand the situation, and withdraw their money from all

acquisitions as well as saving accounts, selling off their assets as they believe that the value of these specific assets would decrease, and hence these investors try to invest these in some other potential market, with favourable economic future. But besides these all conditions, a financial shock may be precisely associated with a political crisis, such as war or terrorist surge, a sovereign default, such as infringement of international rules, crashing of the stock market, or a crisis associated with provisional currency.

According to these findings, proactive measures should be taken to prevent and mitigate the effects of financial shocks in the future. Managing a crisis effectively involves bringing together measures that meet the specific conditions of the shocks, such as fiscal, monetary, and regulatory measures, in order to manage the crisis effectively. A number of packages are being implemented as a part of the effort to promote economic recovery, restore stability, and regain confidence. The key elements include limiting the impact of the crisis, recapitalizing and restructuring the financial sector, improving the mechanisms used to maintain financial stability, encouraging international cooperation, and gaining knowledge from the crisis.

It is important to remember that despite the fact that crisis management measures are crucial, they are not without limitations. Depending on the specific circumstances of the shock and the magnitude of the shock, the effectiveness and effectiveness of these measures can differ. There are also ongoing challenges involved in managing and preventing financial shocks as a result of the interconnectivity and complexity of global financial systems. Future research will need to investigate innovative ways of strengthening early warning systems, risk management practices, and regulatory frameworks in order to address the limitations listed above and to enhance the resilience of the financial system to adverse events, as well as to address these limitations.

To mitigate the impact of financial shocks, we must remain vigilant and make proactive policy decisions. Regulatory authorities, financial institutions, and policymakers should remain proactive in developing crisis management frameworks and implementing preventive measures. It can make economies more resilient to financial shocks and foster sustainable economic growth by safeguarding financial stability.

In conclusion, this study provides insights into crisis management packages and resolutions and contributes to the understanding of financial shocks. This research provides policymakers, researchers, and practitioners with a foundation for developing strategies for enhancing financial stability and resilience in the face of future shocks by looking at preventive measures, limitations, and future research directions. In the end, societies will be better able to withstand and recover from financial shocks if they implement effective preventive measures and proactive policies.

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