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ESSAYS ON INNOVATIONS, NATIONAL CULTURE, AND BANKING SYSTEM STABILITY

By

EDWARD MARFO-YIADOM

Doctoral thesis submitted in fulfilment of the requirements for the award of the degree of Doctor of Philosophy

The Graduate School of Business Administration

University of the Witwatersrand

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ABSTRACT

One of the crucial imperatives to safeguard the stability of macroeconomic frameworks of nations is the financial architecture. The financial system guarantees the flow of financial resources to economic agents and empowers governments to undertake investments, infrastructural development, and sustainable economic development. Nations that have advanced the culture of harnessing financial resources into productivity growth are the known to be experiencing economic affluence. It is incontrovertibly evidenced that the growth in financial resources can augment the capability of nations to promote technological innovation and eventually engender national development. However, banks have become universally susceptible to competition and demonstrate reckless intermediation behaviour. The possibility of high risk taking in the wake of a boost in liquidity can increase the level of instability in the banking infrastructure. Notwithstanding that, the culture of the societies within which banks operate can function as a catalyst for the evolution of credit into sustainable and innovative projects, which can increase the efficiency and effectiveness of banks and strengthen them to weather liquidity shocks. This thesis was setup to examine whether the culture of 107 nations can ignite the innovative tendencies of firms due to the recent intensification of credit to the private sector, advancement in technological innovations, and the amplified transparency of the financial system. The thesis employed the system Generalised Method of Moments to develop three objectives into self-contained empirical chapters. The first chapter examined whether the income level of nations, which is also a measure of technological advancement, can propel nations to use explosions in financial resources to improve the soundness of the banking system. Even though income clubs were found to be crucial in the relationship between financial innovations and economic growth, the chapter did not establish how the

informal institutions that define the values, norms, aspirations, and attitudes of the territories where banks operate can affect the channels through which financial innovations affect the soundness of the banking system. The second objective, therefore, examined the role of the six dimensions of Hofstede's national culture in the nexus of financial innovation and stability of banks. The last objective analysed the role of national culture in banking system stability. This study considered how information sharing systems, which are avenues for financial transparency and institutional innovation, can feature in the financial intermediation role of banks. The results show that financial innovation has a strong positive impact on bank stability for the 107 countries covered in this study. The positive effect of financial innovation on bank stability is even stronger from upper middle-income countries. The study did not establish any relationship between financial innovation and bank stability in high-income countries and lower-middle income countries. In terms of technological innovation, ATM coverage has positive effect on bank stability in high-income countries and upper-middle income countries. The results for financial innovation were robust even after the inclusion of period dummies. In the second chapter, the study found that the national cultural dimensions influence the relationship between financial innovation and bank stability. Indulgence, long-term orientation, and power distance were found to have strong substitution effect on the relationship between financial innovation and bank stability. This connotes that countries with high level of the three cultural tendencies can achieve banking system stability in the wake of financial expansion. Similarly, countries with above average level of uncertainty avoidance can complement the proliferation of finance into banking sector soundness. In the third chapter, it was discovered that countries with high levels of indulgence and masculinity can nurture financial transparency into banking system stability. These findings highlight the imperative

for intermediation strategies of banks in host countries to incorporate the cultural orientations and technological advancement of the communities within which they operate, to guarantee the effectiveness and efficiency in directing financial resources to productivity and induce the soundness or stability of the banking system as well as strengthen the overall macroeconomic framework.

Keywords: Bank Stability; Generalised Method of Moments; Innovation; National Culture; Per Capita Income Clubs

LIST OF PUBLICATIONS

Prior to submission, portions of the thesis have been published in a peer-reviewed journal while another paper is submitted to a journal and under review.

Peer-reviewed Journal Publication

1. **Marfo-Yiadom, E.,** & Tweneboah, G. (2022). The role of national culture in financial innovation and Bank Stability Transmission. *Cogent Economics & Finance*, *10*(1). https://doi.org/10.1080/23322039.2022.2111792

Paper under review

1. **Marfo-Yiadom, E.,** & Tweneboah, G. (2022). Financial Innovation and Bank Stability Across Per capita Income Clubs, *Annals of Financial Economics*

DECLARATION

I, **Edward Marfo-Yiadom**, hereby declare that this research report is my own work except as indicated in the references and acknowledgements. It is submitted to fulfil the requirements for the award of Doctor of Philosophy at the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination in this or any other university.



Edward Marfo-Yiadom

Signed at: **Wits Business School, Johannesburg, South Africa.**

On the .....

DEDICATION

To my wife and children

Akosua, Kwame and Kofi

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ACRONYMS & ABBREVIATIONS

ABBREVIATION	MEANING
ASEAN	Association of Southeast Asian Nations
ATM	Automated Teller Machine
BS	Bank Stability
CAPM	Capital Asset Pricing Model
FI	Financial innovation
Fintech	Financial technologies
GDP	Gross Domestic Product
GFDD	Global Financial Development Database
GMM	Generalised Method of Moments
IND	Individualism
INDUL	Indulgence
IFRS	International Financial Reporting Standards
INF	Inflation
IMF	International monetary fund
LTO	Long-Term Orientation
MAS	Masculinity
MOB	Mobile Cellular Subscription
NIM	Net Interest Margin
PCB	Private Credit Bureau
NPV	Net Present Value
PCR	Public Credit registry

PD	Power Distance
R&D	Research and Development
SME	Small and Medium-Sized Enterprises
UA	Uncertainty Avoidance

CHAPTER ONE

GENERAL INTRODUCTION

1.1 Background to the Thesis

One of the imperatives of the macroeconomic framework of countries is the financial architecture. The system comprises financial markets and institutions that connect suppliers of funds and users of funds in the economy. This intermediary role of the financial architecture guarantees the flow of funds, which eventually brings about national development. Studies have documented the critical role played by banks in the provision of finance to the private sector, which spearheads the productivity and industrialization agenda of national economies (see King & Levine, 1993a; 1993b; Levine, 1997; Aghion, Howitt & Meyer-Folkes, 2005; Laeven, Levine, & Michapoulos, 2015). The intermediation function of the banking architecture reduces information asymmetry and transaction costs, and results in the efficient and effective allocation of credit to more productive sectors of economies. Banks provide credit to households, firms, and governments and stimulate consumption, investment, trade, and government expenditure. In addition to this, the banking framework provides funds to support budding firms in the acquisition and implementation of technological innovation. Banks have also contributed significantly to the financial inclusion agenda of countries through the provision of digitalized financial services. This has been described by the United Nations as a critical tool for the mobilization of resources for the development of economies.

As argued by Pagano (1993), banks also promote efficiency. Banks have instituted the credit information systems as part of their transparency mechanisms, which has induced financial

outreach. This infrastructure provides a dual purpose of ensuring the soundness of the financial system and increased availability of credit to the private sector. A study by Gatsi, Idun, and Mensah (2020) accentuate a direct linkage between credit from depository money banks and the transmission into monetary outcomes such as price stability and money supply. Idun, Agyei, Gossel and Abor (2022) also argue that the conduct of banks and their activities augment the monetary policy function of central banks to achieve stability in the general level of prices, exchange rates, optimal interest rates, and others. This signifies the critical function of the banking sector to an economy and hence the need for the sector to be prioritized to ensure a stable financial system.

In this thesis, three important issues have been investigated. Firstly, we explore how an increase in the advancement of credit to the private sector can induce bank stability. Secondly, the study examined the role of national culture in the transmission process. It tested whether national culture could moderate the functions of the growth in credit to the private sector in bank stability. Lastly, the role of national culture in the transmission process through which private reference bureaus induce bank stability is also analysed.

1.2 Motivation for the Thesis

Several arguments have been espoused on the linkage between banking and financial stability. Whereas researchers such as Allen and Gale (2000, 2004) and Boyd and de Nicolo (2005) argue that competition in the banking sector negatively affects the banks' stability and indicate that bank stability is explained by factors such as performance, competitiveness, regulation, and diversification. Authors such as Mirzaei and Iness (2020); Mutarindwa, Schäfer and

Stephan (2020) also link banks' stability to the movement of macroeconomic factors and posit that financial stability is impacted by the level of economic stability.

Since the global financial crisis recorded in 2007/2008, the focus of researchers has been on the predictors of financial crises and financial stability (Kim, Batten, & Ryu, 2020; Arif, 2020; Islam, Olalere, Sobhani, & Shahriar, 2020; Pessarossi, Thevenon, & Weill, 2020). Despite increased research attention on the predictors of financial crises and financial stability, it has received little attention (Dwumfour, 2017).

Furthermore, although Hofstede (2001) established in his study that national cultural orientations affect bank sector development, the same could not be established on the linkage between national culture on innovation channels of bank stability. The current work sought to ascertain the influence of national culture dimensions on bank stability. Further, it is posited the national culture of a country largely influences the risk-taking behaviour of banks which also explains the nature of competition and financial innovation. The researcher also analyzes the interactive role of technological innovation on bank innovation and bank stability.

The study examines the role of national culture in influencing technological innovations and bank stability. One hundred and seven (107) countries in the per capita income clubs were used for the analysis. The Dynamic Generalized Method of Moment (GMM) was the anlayitcal tool used to determine the link between bank innovation, technological innovation, national culture, and bank stability.

1.3 Statement of the Problem

The debate on the linkage between competition in the banking system and banking stability has remained inconclusive and continues to persist in the circus of academia. Whereas some understand that competition in the banking sector affects the stability of banks (Petersen & Rajan, 1995; Allen & Gale, 2000, 2004; Boyd & de Nicolo, 2005; Goetz, 2018), others argue that a higher degree of market power can enhance the resilience of the financial system and promote its stability (Petersen et al., 1995; Allen & Gale, 2000). According to the authors, mega banks can influence the direction of credit facilities to areas that they consider as profitable through rigorous scrutiny processes and relationship building. This implies that influencing real sector stability. This eventually affects the stability of the financial structure of the economy. On the contrary, it has been argued that competition affects profitability, lowers bank capital value, and increases the risk-taking behaviour of the banks, which in turn affects the stability of the financial system.

The 2007/2008 global financial meltdown highlighted the tendency of technological innovation to ignite a systematic or systemic risk. The foregoing arguments is that banks operating under intense competition are overly exposed to risks, with its attendant effect of weakening the banking system. However, it is not only the nature of competition that induces bank stability and/or fragility. Despite the advent of globalization, the culture of the society which hosts banks can affect how credit is advanced to boost productivity and growth of nations. The emergence of technological advancement to induce financial inclusion and the increased financial transparency can result in a boost in financial soundness. Indeed, there have been several investigations undertaken to highlight the role of national culture in financial

development and financial soundness (see, Boubakri et al., 2017; Buchak, Matvos, Piskorski, & Seru, 2018; Kim, Parboteeah, Cullen, & Liu, 2020; and others). Another study by Cao, El Ghoul, Guedhami, and Kwok (2019) examined the role of national culture in the choice of the exchange rate regimes of 78 countries for the period 1976 to 2014. They found that individualistic countries usually prefer floating exchange rates regime to the fixed regime when they used the instrumental variable other panel techniques. In the same vein, Mourouzidou-Damtsa et al. (2017) found in their study that the national culture dimension of individualism and hierarchy directly impact the risk-taking behavour of 99 banks in nine European countries over the period 1995 to 2014.

Prior to the conduct of this thesis, we did not come across any study that examined the transmission process through which national culture induces: (1) the impact of growth in the credit to the private sector in the risk-taking behaviour of banks (2) the impact of new financial transparency institutions in the risk-taking behaviour of banks. This study addresses the above for 107 countries for the period 2005-2017. In addition, the study is the first to analyse whether disparity in national prosperity can account for the transmission mechanism of the explosion in private sector credit in the risk-taking behaviour of banks globally. To this end, the study shows how income clubs contribute to the role of financial innovations in banking system stability. Since income levels of countries correlated with their level of technological advancement according to economic theories (see, Solow 1956; Romer 1990; King & Levine, 1993; Aghion et al., 2005; Laeven et al., 2015), by examining the impact of income clubs, the study also brought to light how technological advancement which are needed for financial innovation impact on financial innovation channels of banking system soundness.

1.4 Objectives of the Thesis

The study investigates the relationship between bank innovation, national technological innovation, national culture, and bank stability. The following are the specific objectives:

1. To investigate the effect of income clubs in financial innovation and bank stability nexus.
2. To examine the role of national culture in the effect of financial innovation on the risk-taking behaviour of banks.
3. To analyse the effect of national culture on the nexus of financial transparency and risk-taking behaviour of banks.

1.5 Research Hypotheses

The study is guided by the following hypotheses:

H_1: Banks in high-income countries are more likely to support technological innovations to induce the stability of their banking system.

H_2: The national culture dimensions can induce risk-taking behaviour of the banks which can, in turn, influence bank stability.

H_3: The level of national culture can complement the stimulating effect of bank innovation in bank stability.

H_4: The level of national culture can attenuate the impact of institutional innovations in the promotion of bank stability.

1.6 Contributions of the Thesis

The contributions of the financial system to national development cannot be overstated. The banking system oversees the channeling of financial resources to industries to propel national

productivity and growth. The system encourages industrial innovation and new businesses, thereby increasing employment. In several ways, this thesis makes significant contribution to the extant body of literature. First, using a larger cross-sectional sample of 107 countries, the thesis documents evidence that the effect of credit growth on technological innovation, which leads to global banking system stability, is not dependent on country income clubs. This finding contradicts those espoused in the study of Aghion et al. (2005) and Laeven et al. (2015). The theoretical position of these studies was that technologically advanced countries are the only ones capable of developing their financial markets to induce credit growth and advance technological innovation, and thereby boost productivity.

Second, the thesis highlights that bank executives use the national culture orientation of the countries they operate in as collaterals to induce credit diffusion into technological innovations that lead to banking system stability. According to this argument, the study emphasizes that excessive credit does not always lead to financial instability (as suggested in the existing literature) if bank managers consider the national culture of the societies in which they operate. In a situation where managers intend to promote sound banking systems, innovation in the banking system can generate more and sound credits without recourse to the regime's national culture. The study then bridges the gap between studies examining the relationship between financial innovation (in the form of credit generation) and bank stability and those investigating the effect of national culture on the risk-taking behaviour of banks.

The third significant contribution of the thesis to the existing literature is that financial system innovation, such as the emergence of private credit bureaus, can reduce information

asymmetry. This allows managers of financial intermediaries to advance more credits into productive sectors without impeding sound banking and banking sector stability. The assertion relies on the assumption that better information about borrower quality can lower loan rates, giving entrepreneurs more leverage for cheaper loans that can be serviced. This can bring about a situation where loan impairment is reduced drastically and instability in the banking sector is averted appropriately.

This is the first study of its kind that captures developing economies. The study theoretically broadens the competition-stability or competition-fragility argument to include national culture orientation. The findings of the thesis is significant to policymakers in a variety of ways. First, the study informs practitioners in the banking sector about the types of financial innovations to introduce in certain jurisdictions based on their cultural orientations. The abovementioned theoretical, empirical, and methodological contributions are needed to advance knowledge.

1.7 Structure of the Thesis

This thesis is organized into six chapters. The general introduction, motivation for the study, statement of the problem, objectives, hypotheses, contribution to the study, and the structure of the entire thesis is presented in the opening chapter. The second chapter presents a literature review related to the issues the study set out to investigate. Two theories were reviewed in this regard: the destructive, creative, and innovation diffusion theory. An empirical review of the linkages between bank stability, national culture and bank innovation was also presented in

this chapter. The empirical review ends with a summary of the table of the issues identified in the review.

Chapter Three of this thesis presented an empirical article on financial innovation and bank stability among per capita income clubs. Similarly, Chapter Four and Chapter Five present articles on the role of national culture in financial innovation and bank stability transmission and institutional innovation and bank stability, respectively. Lastly, Chapter Six presents the conclusions, general policy recommendations, and areas for further research.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter presents a review of the literature related to the issues investigated. First, the theories that guided the study were discussed. Secondly, an empirical review explains the linkages between bank innovation and bank stability, the interactive role of innovation in bank innovation, and the bank stability transmission process. It establishes the effect of national culture on bank stability. The empirical review ends with a table that summarizes the key contributors to the issues of bank stability, innovation, and culture. Furthermore, the measurement for the key variables of the study, that is, bank stability, national culture, and innovation, were also presented in this chapter.

2.2 Review of Theoretical Literature

Financial stability does not lend itself to a consensus definition. Usually, it is best to look at it in terms of the reverse – financial instability – since that triggers people's attention to the phenomenon where things are not normal in the financial market and when financial intermediation has been rugged. Financial instability starts subtly with rising asset prices in a stable financial market. People demand more of the asset with the hope of selling it later for a higher price. However, suppose economic events lead to a future fall in asset prices. In that case, it may lead to an unfavourable effect on the financial intermediaries which finance their asset portfolio through contractual borrowings. Financial instability can also occur when financial intermediaries cannot honour their contractual obligation. The following pages contain discussions on some banks in (stability) sources.

2.2.1 The Creative Destruction Theory

Schumpeter (1911), as cited by Śledzik (2013), postulated that innovation is crucial for economic progress to the extent that economic development happens because of innovation, entrepreneurship, and market power. Tülüce and Yurtkur (2015) noted that creative destruction argument advanced by Schumpeter (1942) occurs when economic agents introduce new products, processes, systems, markets, and technology that are more valuable than existing ones.

The concept of creative destruction applies to the changes in the market structure from a monopolistic market to a competitive market and vice-versa and their implications on market dynamics such as prices, liquidity, and productivity. The theory also applies to using new financial technologies (Fintech) by financial institutions to replace conventional financial service provision. Virtual and digitalized financial service delivery affords to speed, efficiency, and coverage but can also be a liquidity risk apart from the high investment costs that come with digitalized financial service delivery. For instance, using the time series method for a Ghanaian dataset, Ansong et al. (2011) suggests that digitalized financial innovation in the form of automated teller machines (ATMs) and debit cards can encourage withdrawals is detrimental to financial savings.

In terms of new institutions, the creative destruction theory suggests that the emergence of institutions, such as deposit insurance and credit referencing bureau, will increase the risk-taking behaviour of financial institutions without a bank having to suffer from bank runs and information asymmetry and thereby avoiding adverse selection and moral hazards in the loan and deposit markets. The possibility of reducing information asymmetry will induce low

equilibrium loan rates (Stiglitz & Weiss, 1981) and improve loan recovery rate (reduce loan impairment), which in turn lead to financial stability.

Before the endogenous Schumpeterian growth theory, Romer (1990) postulated that economic growth is induced by innovation in product variety. Entrepreneurs who come up with innovation would be given legal protection to enjoy monopoly rent, which is greater than inventors' cost of research and development. Such rent protection led to the development of new product variety, leading to productivity growth. However, in the endogenous growth perspective, a new product developed through technological innovation does not make existing innovations dysfunctional, which presupposes innovation may not necessarily mean the quality of innovation.

The new Schumpeterian endogenous growth perspectives stress on the quality of innovation (Aghion & Howitt, 1992). The authors emphasize that if innovations are superior to the existing product, innovators will enjoy intellectual property rights if their products remain the reigning innovation. When a superior product emerges, the new product would 'destroy' the intellectual property of the existing one. This means it pays to innovate since innovators would receive more rent from intellectual property protection than laggards.

Now, what is the role of financiers in promoting technological innovation into productivity growth? According to the Schumpeterian growth theory, financial intermediaries perceive innovation is desirable; therefore, they engineer processes to spot and provide financial resources to support viable projects by entrepreneurs. King and Levine (1993) "construct an

endogenous growth model in which financial systems evaluate prospective entrepreneurs, mobilize savings to finance the most promising productivity-enhancing activities, diversify the risks associated with these innovative activities, and reveal the expected profits from engaging in innovation rather than the production of existing goods using existing methods". The authors stress that financiers develop state-of-the-art screening technology to ensure that only firms with patent rights receive funds to implement their innovations. If financial intermediaries do not innovate in their loan screening processes, they would channel credits to borrowers without credible projects, which can be detrimental to financial stability and productivity growth. Since financial intermediaries also develop new technology to mobilise savings that can be advanced to support innovations, the endogenous growth theory stipulates innovations are financed through new savings that generate new loans.

However, allocating more credits to the productive sector can have some implications. First, mobilizing more savings into loans should imply that the loan rate should be dearer for a very long time for financiers to maintain a certain level of asset price that would ensure the smooth functioning of the financial system. Suppose asset prices begin to fall due to inflation or external shocks (that turn to make innovations go bad, which implies that borrowers may be unable to honour their loan obligations). In that case, it will affect the financial system's smooth functioning, which can cause financial instability. The second implication is that a boom in credit allocation to support firm innovation can lead to excess liquidity, which can bring the loan rate down, detrimental to the banks' loan spread and, therefore, their profitability.

To protect their course, a hypothesis of Petersen and Rajan (1995) was that some financial institutions leverage their size to create a favourable relationship with entrepreneurs with positive outlook projects so that they can provide financial assistance to viable-but-currently-unattractive firms so that when these firms become profitable, the financiers can extract some rent to redeem the subsidies provided earlier. Such relationship building now encourages innovations and sustains large financial institutions' market share. However, Petersen et al. (1995) believe that large banks that control a larger share portion of the market are best positioned to allocate loans to innovative firms more cheaply than smaller and less-competitive firms.

Furthermore, Aghion, Howitt and Meyer-Foulkes (2005) believe that countries that innovate are more likely to develop their financial sector to encourage further innovations than those that adopt innovations. They stress that countries designated as innovators are more likely to channel funds from financiers to propel the growth rate in per capita income to the income level of the world's technological leader, except the technological leader continues to innovate at a level beyond that of technological laggards. This view received support from the endogenous growth model developed by Laeven et al. (2015) that countries with higher growth in the share of credit to the private sector (which they termed the financial system's innovation) can induce the growth in their per capita income to the income level of the world's technological leader, the United States of America. Idun (2021) has produced empirical support for the endogenous growth model by reporting that 13 African countries that have some appreciable level of growth in the share of credit to the private sector can experience the

growth in income that would propel them to converge to the per capita income level of the United States of America.

Furthermore, financial institutions innovate in financial technologies that assist them in screening borrowers, diversifying their asset portfolio, reducing transaction costs, improving access to finance by productive economic agents and ameliorating their risk exposure (King & Levine, 1993; Levine, 1997; Aghion, Howitt & Meyer-Foulkes, 2005; Laeven, Levine & Michapoulos, 2015). Examples of such innovation include the emergence of financial technologies that are assisting banks in service delivery, such as mobile money, internet banking, and cryptocurrency, among others; and the adoption of the International Financial Reporting Standards (IFRS), which has improved the quality of financial reporting which, in turn, can increase the credibility of firms for credit allocation.

For depository-taking institutions, the degree of market power has a bearing on their charter value which induces risk-taking behaviour, including innovation to induce greater charter value. Increases in competition in the deposit market reduce deposit rates which, in turn, reduce banks' profit levels. A reduction in banks' profit reduces the market share (market power). The direct result of the decline in market power is the reduction in the market price of banks (Kelley, 1990), and in their quest to improve charter value, banks assume new risks.

The banks can introduce new loan products without adequately screening technology, thereby encouraging moral hazards and adverse selection (Dell'Ariccia, 2001). Therefore, in the deposit market, the competition encourages innovation in the form of risk-taking behaviour

that increases the deposit rates, thereby reducing banks' profitability. In the loan market, competition reduces the loan rate, which can harm the charter value, encourage risk-taking behaviour and, therefore, increase (reduces) the fragility (stability) of the banks (Petersen & Rajan, 1995; Allen & Gale, 2004).

There are other arguments that underlie this how bank stability is determined. These arguments provide the basis for the analytical framework of this study. The first objective analyses bank innovation's effect on bank stability. Johnson and Kwak (2012) posit that a suitable financial innovation enhances financial intermediation. A similar view is also expressed by Schumpeterian that suggests that the efficient distribution of resources into productive activities largely depends on the level of financial innovation. This means that Innovative firms will be efficient in their pursuit of profit which invariably will ensure a sound financial system. (Petersen et al., 1995; Allen et al., 2004; Aghion et al., 2005; Leaven et al., 2015).

Financial innovation comes along with lots of benefits including diversifying loan portfolios (King et al., 1993) lowering loan rates and attracting small businesses thereby ensuring their sustainability (Boyd et al., 2005). On the contrary, financial innovation can injure the banking system's stability as was witnessed during the 2007/2008 global financial meltdown which saw the collapse of lots of financial institutions.

For example, Ghana recently reported about the collapse of several banks due to regulatory lapses on the part of the Bank of Ghana and the Securities and Exchange Commission. Banks' quest to lure more customers can contribute to the relaxation of their loan screening processes

which in turns can increase non-performing loans and the banking system's fragility (Allen & Gale, 2004, Dell Ariccia, 2001). However, the repercussions of these activities are larger when banks are networked because of financial innovation (Allen, Carletti & Valenzuela, 2013). Furthermore, industrial economist also argues that market power and competition are critical factors that can contributes to bank stability.

According to Kelley (1990) the banks' quest to attract more customers or clients tend to attract lower interest rates which also influences the risk-taking orientation of banks. It is argued that large banks can use their efficiency, economies of scale and improved screening processes to make more credit available to profitable firms and at the same time compensate the banks with higher rents (Petersen et al., 1995). The banks with market power can create and sustain relationship with small businesses which can help smaller businesses survive and grow. The reward for engaging in relationship banking is an increase the banks' market share.

Furthermore, Boyd and de Nicolo (2005) also argue the actions of banks that control a larger share of the banks' customers can lead to decisions which turn to limit access to credit and eventually reducing opportunities for firms to implement projects which have net present values. Pagano (1993) is also of the view that competition in the banking sector contributes to reducing leakages which culminates into rising savings rate and that also guarantees higher deposit rate and reduced lending rates. It follows that a reduction in the lending rate can reduce loan impairment, improve the liquidity of banks, and eventually lead to bank stability. However, uneven distribution of information among market participants can reverse the gains in stability due to low loan rates and boosts in liquidity.

The Schumpeterian-Finance-Growth theories underpin the study in the sense that explosions in financial resources contributes to technological innovation which in turns induces productivity growth. Since economic growth also contributes to greater risk-taking by the banks, we can infer that technological innovation that are occasioned by the growth in credit to the private sector can boost banks' risk-taking. The above leads to the first hypothesis of this thesis:

H1: High income countries with greater amount of credit to the private sector can induce higher risk-taking behaviour of banks operating in their territory.

2.2.2 Innovation Diffusion Theory

A financial institution can develop innovations to reduce financial stability or improve its performance. However, if the system does not understand how the innovation works for the masses, the innovation will not achieve the desired end. The innovation diffusion theory was popularized by Rogers (1995), which stipulates that the workability of innovation is dependent on how the innovation is translated into the way of life of the intended audience. Innovation that is not diffused into the society's culture through effective communication will not achieve its intended goals no matter how effective that innovation is. This implies that the level of national culture is critical in ensuring that people understand the intent of innovation in enhancing their lives and welfare.

To this end, Rogers (1995), as cited by Miller (2015), proposed four factors that affect the diffusion of innovation. The four factors are invention, communication channels, time, and the social system. He proposed that the nature of innovation influences its adoption to the extent

that the innovation must be functional to ensure that people buy into the idea. An individual goes through a decision-making process before he/she accepts the innovation; therefore, the orientation of the individual informs him/her to adopt a new product, idea, or practice. Also, whether an individual would adopt innovation or not depends on the individual's perception of the essence of the innovation in his/her life or that of society. Since individuals become altruistic about the consequences of innovation, the acceptability of innovations depends on the extent of societal-induced-communication about the benefits of the innovation.

In Rogers' proposition, the success of innovation depends on how it is adopted. However, the cultural orientation of a particular society can also influence how innovation is adopted (Naqshbandi & Singh, 2015). Naqshbandi and Singh (2015, p.43) summarize the effect of societies' culture on the adoption or acceptance of innovation as follows: "*Given the information flows through networks, the nature of the networks and the roles of the opinion leaders determine how likely it is for the innovations to be adopted. Apart from the opinion leaders, who use their contacts to influence the behaviour of prospective innovation adopters, other intermediaries, called change agents and gatekeepers, also form a part of the diffusion process*."

Thus, the innovation diffusion theory explains why the national cultural dimensions can serve as conduits for the transmission process through which financial innovation leads to banking system soundness. Financial innovations that are meant to boost deposits to improve the liquidity positions of the banks can achieve its purpose partly when the culture of the society encourages savings and investment in the people. In the same token, financial innovation that

is meant to boost loans allocations to the productive sectors can achieve the purpose in a society that support hard work and entrepreneurial activities. To this end, the study formulated the following hypothesis: Financial innovations would be beneficial in societies with strong or higher levels if individualism, strong individualism indulgence, and long-term orientation than its impact in the society with strong levels of power distance, uncertainty avoidance and masculinity are more likely to avoid risk-taking and therefore influence the soundness of the banking system.

2.2.3 Information Asymmetry Theory

Information is crucial for the sound functioning of financial markets. In a perfect market, information flow is evenly distributed between financial intermediaries and borrowers so that none can provide false information in the credit contract. However, in the real world, we would rather have imperfect markets, implying that one party to a loan agreement can have an advantage over the other. Suppose borrowers have more information than lenders. In that case, they can present loan proposals, obtain the loans, and use the proceeds on unproductive activities (moral hazards), making it difficult for them to pay back. Due to inadequate information, financiers can end up distributing credits to bad borrowers (adverse selection).

Akerlof (1970) was one of the earlier authorities to use the used car market episodes to illustrate how information asymmetry can affect creditors' asset prices. According to Akerlof (1970), the prevalence of bad cars reduces the value of good cars in the used-car market. If we juxtapose this assertion to what happens in the loan market, we find that the loan cost can increase because of moral hazards and adverse selection. Because financiers cannot obtain all credible information from borrowers, they use high-interest rates to herd credit allocations even

when more loanable funds are available (Stiglitz & Weiss, 1981). Financial institutions that can mitigate information asymmetry and therefore gather more information about borrowers can reduce their credit risks and improve their stability.

Stiglitz et al. (1981) suggest that borrowers may conceal information about the returns and risks of their projects. Therefore, if lenders charge the same loan rates, the cost of loans for risky projects would appear lesser than the cost of loans for viable projects. In the end, financiers would use interest rates to ration credit resulting in financiers charging higher interest rates on loans of projects that are perceived risky in order to reduce their credit and liquidity risks.

Over time, institutions emerge to alleviate the problem of moral hazards and adverse selection between borrowers and lenders. Financial intermediaries have the expertise to collect information about borrowers, use it to screen borrowers and ascertain the level of the worthiness of borrowers given the viability of their projects. According to Laeven et al. (2015), financial intermediaries employ state-of-the-art technology when screening borrowers so that only entrepreneurs with good projects would obtain finance to support their projects. Notwithstanding, financiers can also use loan rate differentials to discriminate among projects with different risk profiles. High-risk projects would attract higher loan rates than low-risk projects. The problem emerges when attracting high loan rates; financiers concentrate on granting credit to finance high-risk (relative to return) projects. Another problem is when the financiers fail to develop potent technologies to pinpoint credible borrowers for credit allocations. Now, due to technological advancement, lenders have better ways of determining

and learning about the characteristics of their borrowers to minimize information asymmetry – they use information-sharing systems. However, bank managers tend to be busy so in modern times, they employ credit scoring institutions to provide information about borrowers before they advance loans.

2.2.4 Credit Referencing Bureau

Pagano (1993) showed in a model that lenders in severe adverse selection environment who are prepared to share information about borrowers are more likely to induce a boost in the volume of lending, the mobility of borrowers, advance in information technology and contribute to enhance the credit market. Lenders are incentivized to share information about their borrowers to benefit from an information-sharing network that collects and stores information to reduce information asymmetry. Financiers who provide more information in the system enjoy increasing return to scale regarding using the information in the credit transmission process.

This implies that there are intellectual gains from partaking in information sharing. Banks which do not partake in information sharing can induce adverse selection, which can be detrimental to their stability. Pagano (1993) further report that information sharing can attenuate the adverse effects of adverse selection and moral hazards in opaque credit markets even when there is a surge in lending activities. The authors suggest that information sharing reduces the fear of information asymmetry, boosting lending activities. Since information sharing induces banks to make more loans available to borrowers, it can boost liquidity and stability when loans are given to credible borrowers. Institutions collect and store data on borrowers so that a network of lenders who have subscribed for information can obtain credible

information to avert extending credits to risky borrowers. Credit information sharing can induce new credits into productive sectors and minimize loan impairment, thereby boosting liquidity and economic activities.

Similarly, Vercammen (1995) employs a multiperiod model with adverse selection and moral hazard to demonstrate that a certain amount of adverse selection is required in a lending market for borrower reputation incentives and aggregate welfare. He believes that a system of complete information exchange may be less efficient than one structured to retain a certain level of information asymmetry, for as by restricting the length of borrower data that is maintained.

Padilla and Pagano (1997) examine the impact of information sharing as a "borrower discipline technique" in the context of perfect competition. They find that borrowers are more motivated to perform if lenders trade only negative information, claiming that sharing good borrower attributes can minimize the negative effects of default and the disciplining effect of credit bureaus.

Jappelli and Pagano (2000) argue that credit bureaus are diminished in emerging nations with substantial informal sectors where repayment enforcement is challenging. They propose that allowing credit bureaus access to informal financing will boost the credit bureau's utility for both formal and informal lenders due to the industry's economies of scale. Jappelli and Pagano (2000) propose that banks may change from collateral-based lending policies to information-based lending policies because of improved information.

Jappelli and Pagano (2002) conduct the first empirical examination into the existence and influence of credit bureaus in various global nations. The presence of credit information systems relates to larger credit markets and lower credit risk, according to their findings. Credit information systems generate a screening impact that enhances the risk evaluation of loan applicants, enhancing portfolio quality and decreasing delinquency rates. As information about borrower behaviour is shared among lenders, the existence of credit bureaus can also provide an incentive effect that may discourage irresponsible borrowing. Some borrowers on the verge of misusing borrowed funds may be dissuaded from doing so, provided they place a high enough value on future loan availability. These efficiencies are passed on to borrowers in the form of a lower cost of capital in a competitive credit market. Therefore, improved informational flows increase the overall efficiency and stability of the financial system. However, due to the nature of credit information systems as public goods, the natural emergence of lower costs in the credit market is not always assured (McIntosh & Wydick, 2005).

The new industrial organization view on banking market structure and its effects on bank stability has held that a more aggressive banking system will result in a greater soundness of the banking system principally because bank competition reduces the loan rate and helps mobilize funds into productive sectors compared to a less competitive banking system. However, competition can lead to a rush in credit allocation, which connotes the inability of the lender to adhere to the prudent credit allocation processes, which can lead to the advancement of credit to bad borrowers (Dell Ariccia, 2001). Also, as earlier discussed, banks

mitigate information asymmetry by charging higher loan rates in an opaque banking system. High loan rates can lead to loan impairment, which can be detrimental to the banking system's stability. Information sharing systems, therefore, provide transparency in the banking system to reduce the weaknesses in the competitive banking systems in boosting credit creation.

Borrower information sharing can aid banks in extending credits without taking excessive risks in a competitive banking environment. Even in less competitive banking environments, the availability of borrower information can aid in relationship banking to induce sound credit creation and bank stability (Petersen et al., 1995). By plummeting default rates, information sharing can also reduce lending costs in a competitive banking environment. A school of thought suggests that only firms participating in credit information sharing benefit from such a system. Thus, the use of information sharing systems would lead to bank stability since it improves the asset quality of banks.

2.3 The role of National Culture

According to Hofstede (2001, p. 9), culture is *"the collective programming of the mind that distinguishes people of one country, region or group from people from other countries, regions or groups*". Culture permeates all endeavours of humankind, providing the driving force for economic activities. The role of culture in the societal landscape can be seen in Williamson's framework of social analysis, which consists of four levels (Cao, El Ghoul, Guedhami, & Kwok, 2019). The first level, the social embeddedness, comprises informal institutions such as customs, norms, mores, and traditions.

Culture is rooted in these tenets as the customs, norms, mores, and traditions differ from one society to another. With respect to banks' risk-taking behaviour, bank managers tend to imbibe the informal institutions of the country of their operation in the credit creation activities of their banks. Opinion leaders in society can, for instance, be accorded the benefit of the doubt that they will make good their loan obligations. Therefore, bank managers tend to be less stringent when dealing with leaders of the community, which provide more collateral for credit creation. Banks also tend to sponsor festivals and other traditional events, providing avenues to reach out to more customers for loans and deposits. Informal institutions can also dampen the workability of the banks' strategies when the socialization on financial matters does not favour formal financial services provision.

The second level of Williamson's social analysis is the institutional environment level which comprises formal rules, such as the “executive, legislative, judicial, and bureaucratic functions of the government” prevail. Licht, Goldschmidt, and Schwartz (2005) argue that the laws of a country are closely linked to its cultural orientation. This means that the policies of the country will depict the culture of the society. The regulatory framework of a country’s financial system falls under this category. The banking system is heavily regulated, and historical, the regulations of the banking system have fueled financial innovation in many countries. This means that a country’s formal institutions of regulation directly affect the risk-taking behaviour of managers of financial institutions. The formal regulatory system can also restrict entries of banks which can increase the loan rate, leading to loan impairment and, therefore, banking system instability.

The third level of Williamson's hierarchy incorporates governance institutions which in the view of especially contracts. In line with the study, a country's system of the rule of law, regulatory quality, good governance, protection of intellectual properties and enforcement of contracts and good business environment can decide banks' risk-taking behaviour. All things being equal, a society which cherishes strict enforcement of regulation and sound institutional support is more likely to support risk-taking financial intermediation activities of the financial institutions. Banks would be better off leveraging high collateral charges in society with a culture that does not promote inclusiveness.

The fourth hierarchy of Williamson's social analysis framework implies the distribution and employment of resources, where economic agents enhance and adjust prices and quantities, incentive alignments, etc. This aspect of social analysis is in line with the cultural tenets that influence the financial sector to allocate financial resources to productivity growth. It is well documented that countries with a culture of leveraging technology for growth are the ones that use financial innovation to induce economic growth (King et al., 1993; Aghion et al., 1992; Aghion et al., 2005, Leaven et al., 2015). In a technologically endowed regime, the financial sector develops mechanisms to attract and distribute credits to implement new projects.

However, the national culture framework popularized by Hofstede (1980, 2001) has been dramatically applied in the empirical literature. Hofstede (1980) initially developed the national culture dimensions through surveys on international presence management and leadership of organisations. In more recent years, the cultural dimensions have been applied in studies in the areas of Finance and Economics, with most of the studies confirming that the

national culture dimensions have economic implications. Hofstede (2001) constructed and classified the dimensions into power distance, individuality, masculinity, long-term orientation, and uncertainty avoidance. National culture dimensions can influence the risk-taking behaviour of bank managers directly and indirectly. Directly, national culture can induce greater risk-taking across managers of different sovereigns if managers are required to leverage differences in the regulatory regimes in different countries. Indirectly, bank managers are expected to accommodate different needs and levels of risk-aversion of their clients across different cultures.

Power-distance index reflects the extent of dispersion of power between the most powerful and less influential in a society where the less powerful recognize the uneven distribution of power. The construct's developers suggest that the less-powerful economic decision is predicated on the economic decision of the most powerful. In this vein, regimes with higher levels of power distance index have more dependent arrangements between superiors and subordinates. Superiors have high levels of power distance which implies that the economic decision they make influence the same decision taken by their subordinates.

According to Zheng et al. (2012), economies with a lower level of power distance exhibit a higher degree of trust in economic exchanges, which lowers transaction costs, suggesting that power distance is associated with high transaction costs. Concerning the current study, financial managers of banks in economies with power distance are faced with a higher degree of risk-taking. In their resolve to reduce costs of operation and cost credit, they become prone to risk-taking, which can injure the stability of their banks.

Power distance indicates that when people see themselves as not being powerful, they tend to think that power is not equitably distributed among members of society. As power distance reduces, the rate of importation of technological innovation for development is likely to go up. Figure 2.1 shows that the scores for power distance are highest in Slovakia, which shows the greatest dependency and lowest in Austria, which indicates low dependency. When banks target members of society who are considered influential, the more likely such persons will accept the innovation so will their dependents. This goes to contribute to the stability of banking system.



Figure 2.1: The scores of Hofstede's Power Distance Dimension. Source: Hofstede's National Culture Insight

Individualism/collectivism is the second component of national culture. The extent to which members of society pursue their interest or those of the group or society defines individualism. In a highly individualistic society, individuals and their immediate families take precedence over society. A lower index degree indicates a greater degree of a collective society in which group commitment, loyalty to societal culture, and adherence to societal cohesion are high. Figure 2.2 shows that individualism is highest in the United States of America and Lowest in Guatemala. High-individualistic nations are inclined to pursue opportunistic behaviour, which can induce greater risk-taking in the management of financial institutions. To this end, individualism can induce financial innovation and bank stability

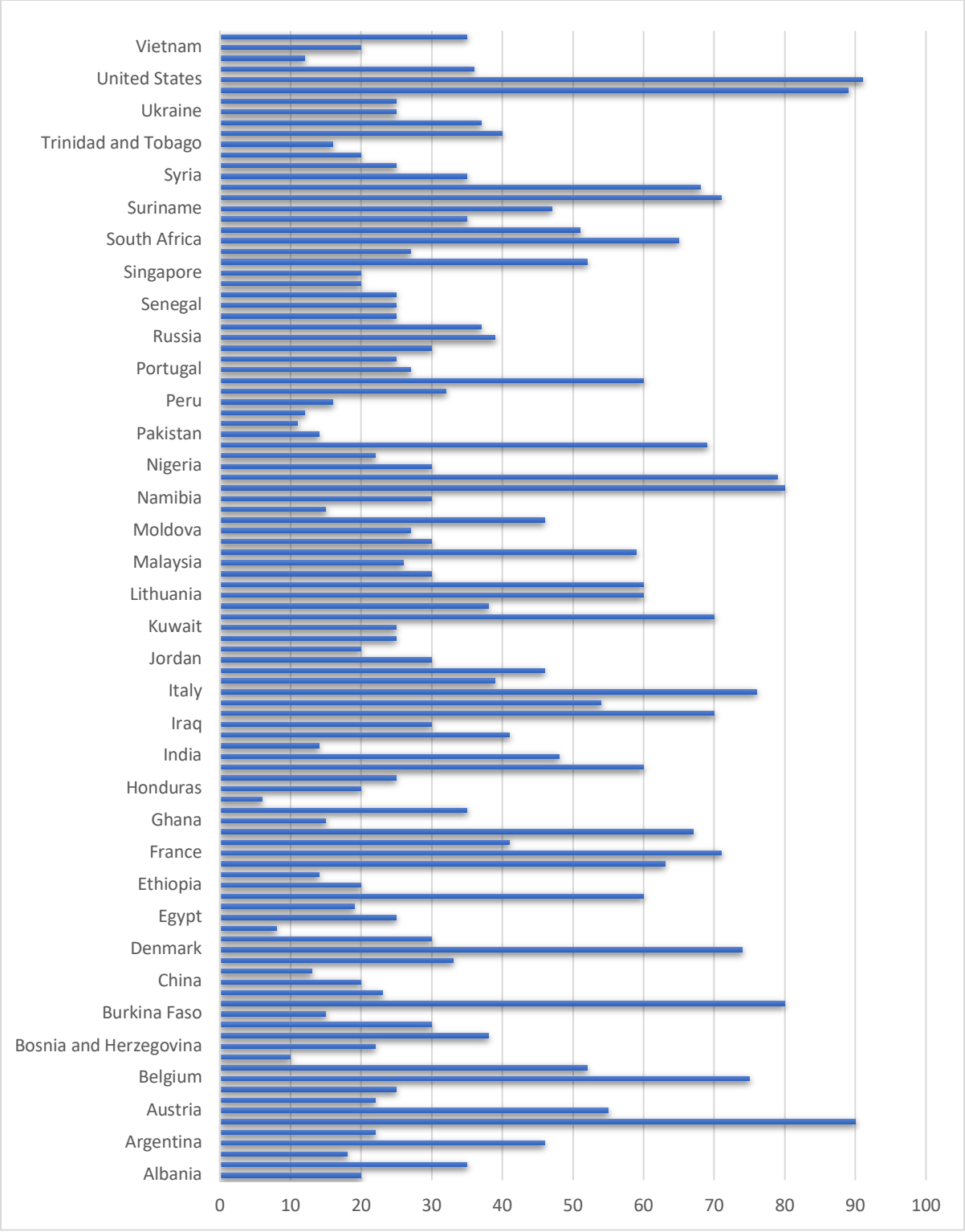


Figure 2.2: The scores of Hofstede's Individualism Dimension. Source: Hofstede's National Culture Insight

The third dimension of national culture is the avoidance of uncertainty. This relates to a culture's acceptance of uncertainty. A society's ability to accept innovation largely depends on its ability to accept uncertainty. The study, therefore, takes the view that members of a society that do not accept uncertainty are less likely to accept innovations, which means that financial innovations in the banking sector will not be accepted which will affect the stability of the banking system. Figure 2.3 shows the uncertainty avoidance distribution, indicating that the scores are lowest in Singapore and highest in Greece.

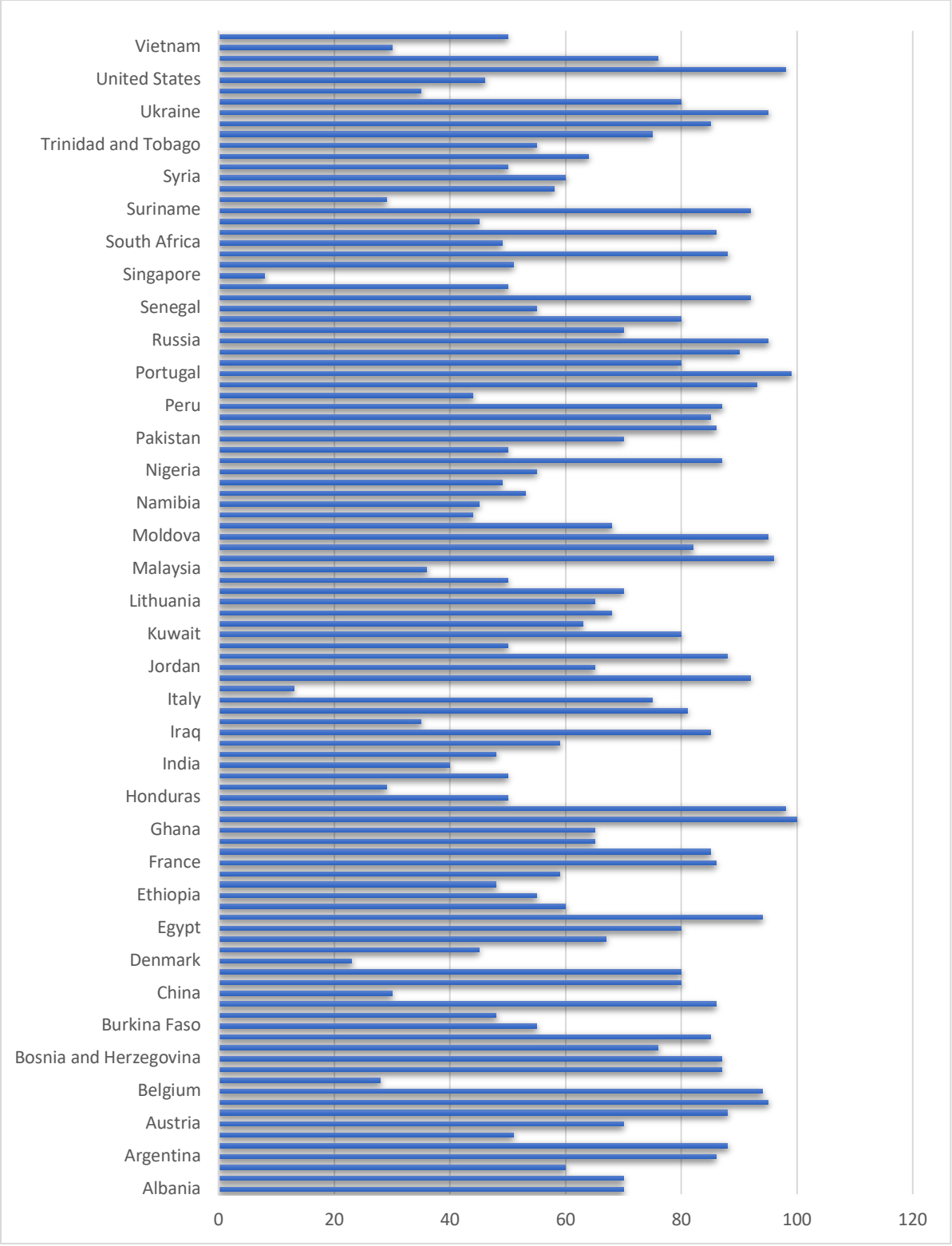


Figure 2.3: The scores of the Uncertainty Avoidance Dimension. Source: Hofstede's National Culture Insight

The fourth aspect of national culture is the masculinity/femininity dichotomy. According to Hofstede (2001), masculinity is "society's preference for achievement, heroism, assertiveness, and material rewards for success." In contrast, femininess is *"society's preference for cooperation, modesty, caring for the weak, and quality of life."*. A low score on Hofstede's index indicates feminism, suggesting that a greater proportion of the population is concerned with the welfare of others and the quality of life. A higher score indicates that a more masculine society accepts competition and strives to be the best, which may favour the risk-taking behaviour of economic agents. Figure 2.4 shows that masculinity is highest in Singapore and lowest in Sweden.

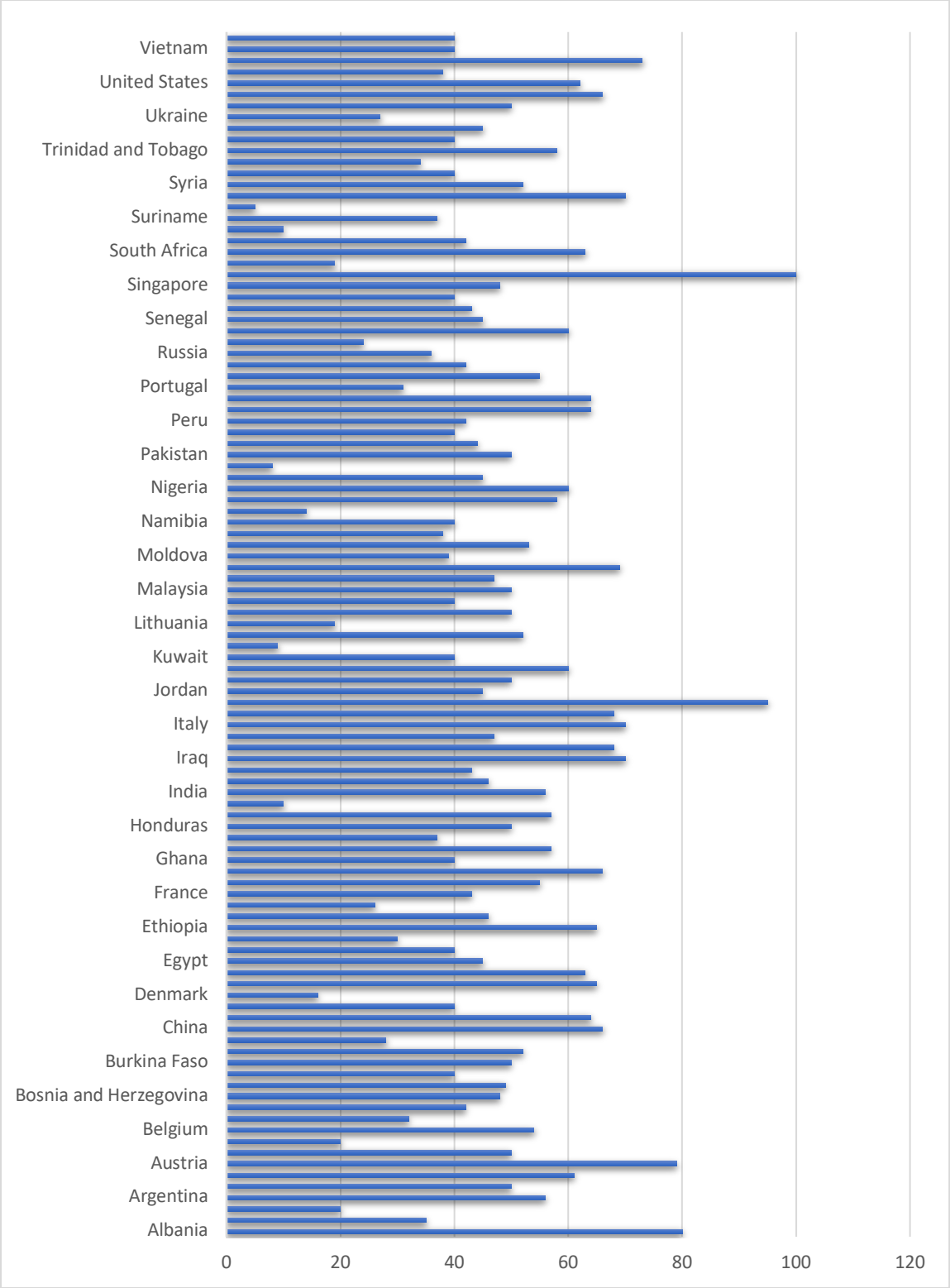


Figure 2.4: The scores of Hofstede's Masculinity/Feminism Dimension. Source: Hofstede's National Culture Insight

Long-term/short-term orientation is the fifth dimension of national culture, indicating the degree to which traditions are upheld and protected versus the acceptance of future challenges. Figure 2.5 shows the distribution of the scores of long-term orientations of the countries. It shows that LTO is highest in Japan and lowest in Ghana.

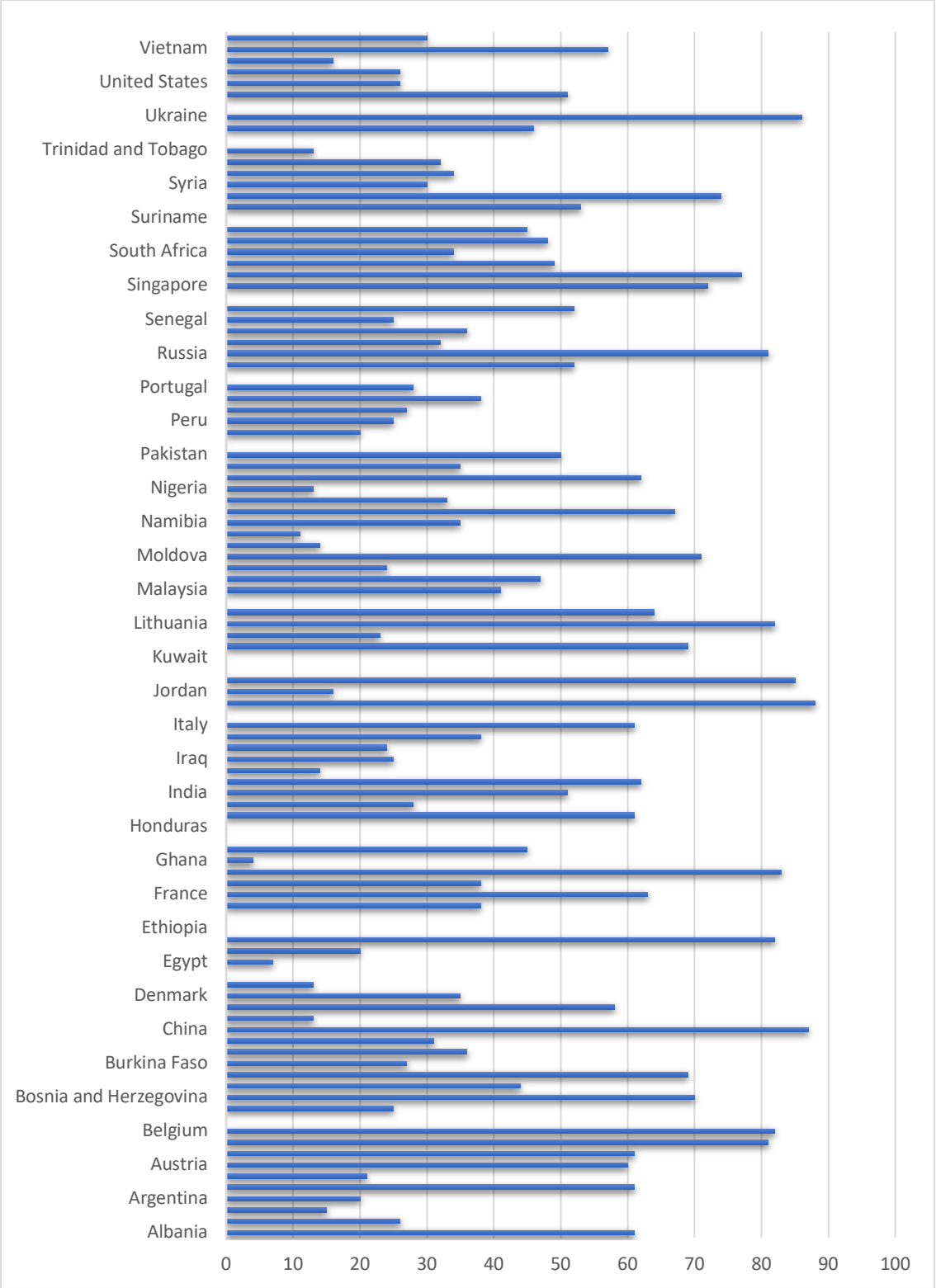


Figure 2.5: The scores of Hofstede's Long-Term Orientation Dimension. Source: Hofstede's National Culture Insight

The final dimension of culture is indulgence/restraint, which measures the extent to which members of a society are governed. Lower scores indicate restraint concerning desires and impulses, whereas higher scores indicate greater indulgence or freedom to pursue one's course. Figure 2.6 shows the distribution of indulgence, highlighting the contrasting levels of indulgence between Venezuela and Egypt.

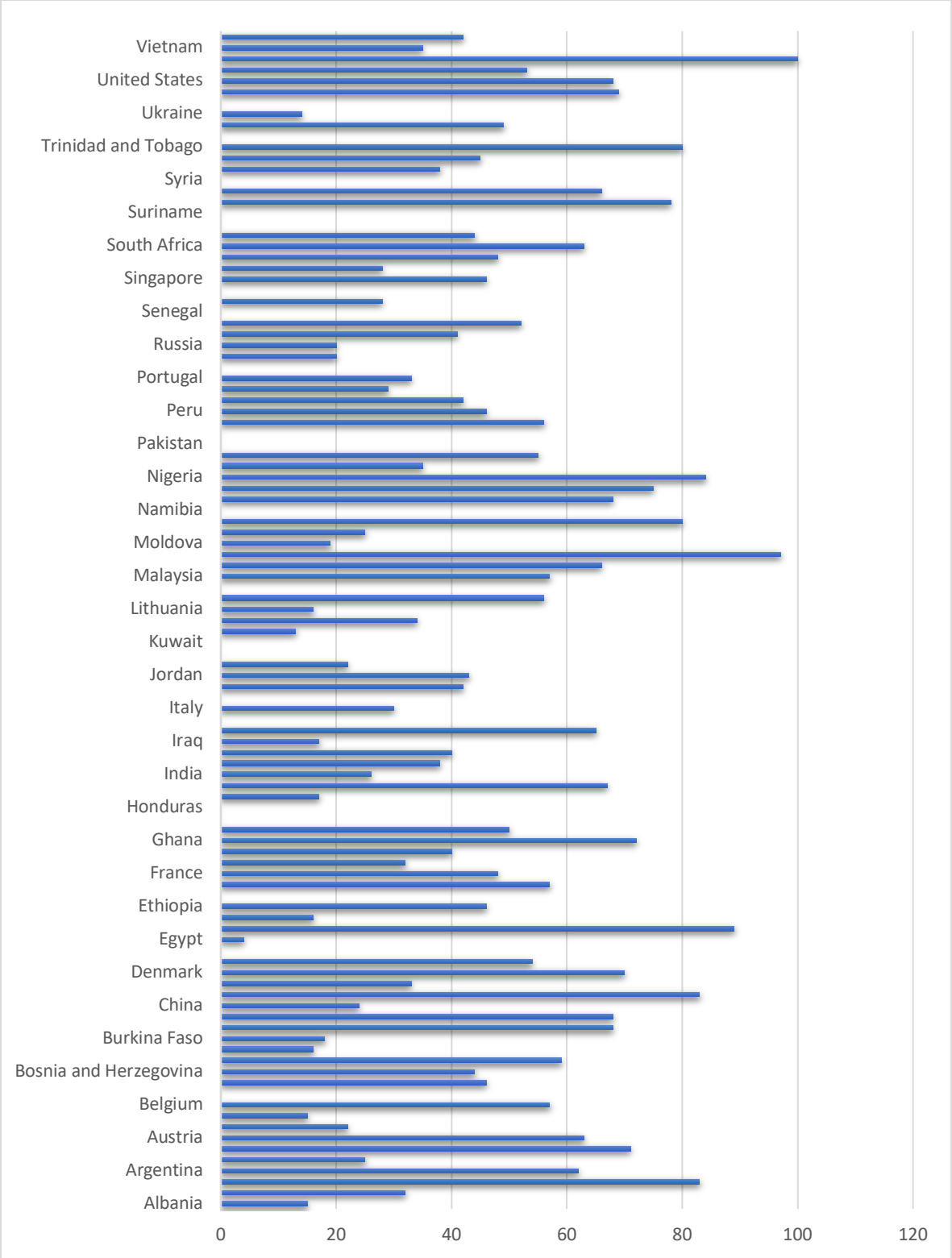


Figure 2.6 The scores of Hofstede's Power Distance Dimension. Source: Hofstede's National Culture Insight

2.4 Review of Empirical Studies

Several studies have been conducted that sought to explain the linkages between bank competition, national culture, and bank stability. Fu, Lin and Molyneux (2014) reported that the concentration of banks contributes to financial fragility. It further reported that when countries institute strict entry measures, it greatly contributes to ensuring stability. It also reported that having insurance schemes in place also contributes to bank fragility. Similar findings were also reported in the study of Yang and Shao (2016). It was reported that bank competition results in increased loan growth. However, it found that banks were less sensitive to monetary shocks. This supported the findings in the study of Bostandzic and WeiB (2018) which also reported that large European banks are greatly exposed to systemic risk due to the quality of their loan portfolios. However, the study of Zins and Weill (2018) indicated the proliferation of Pan-African banks has greatly contributed to the efficiency of the banking system.

On the issue of national culture and bank stability, Boubakri, Mirzaei and Samet (2018) reported that national culture contributes to bank performance in times of financial crisis. Liang et al. (2017) in their study also reported that lending and credit guarantees negatively affect banks' efficiency. Whereas Islam, Olalere, Sobhani, and Shahriar (2020) reported of a positive effect of market influence on stability in Malaysian and Singaporean banks, a negative correlation was reported between competition and stability among banks in Indonesia and Thailand.

Further findings show that product market competition has a positive impact on capital ratios at banks in Malaysia, Singapore, Indonesia, and Thailand. In the Philippines, however, the

relationship between product market competition and the capital ratio is negative. This finding lends support to the competition-stability viewpoint and suggests that banks in more competitive markets maintain a higher capital ratio to absorb unexpected losses. Vo, Nguyen, and Van (2020) used a dataset of 3071 Asian banks from 2008 to 2017 to investigate the relationship between financial inclusion and financial market stability. They employed the generalized method of moments (GMM) approach. Their findings indicate that greater financial inclusion by banks positively and significantly contributes to banking sector stability.

Abuzayed et al. (2018) posited that bank diversification and stability are stronger in conventional banks than in Islamic banking systems. They claim that, while higher levels of diversification can help banks reduce risk, conventional banks are more vulnerable to systemic risk compared to Islamic banks. Similarly, Kim et al. (2016) reported that when credit is advanced to firms in dire financial crisis, it has little or no effect on innovation. Their paper also suggests that when firms have a stable financial arrangement, their innovation performance improves.

Dwumfour (2017)'s work is closely related to the proposed study. It was focused on the determinants of bank stability in Sub-Saharan Africa. The study reported that competition improves bank stability during financial crises. Furthermore, by mediating the effects of regulations, the author discovered evidence favouring both the concentration-fragility and concentration-stability hypotheses. The author also mitigated the effects of financial crises. However, Dwumfour’s work (2017) did not investigate how bank innovation, technological innovation, and national culture in the framework predict bank stability.

The aftermath of the 2007/2008 crisis ignited the need for investigations into the risk-taking behaviour of financial institutions. The extant evidence has demonstrated that information systems are instrumental in attenuating financial fragility. Leon and Guerineau (2018) used a dataset from 159 developed and developing countries to show with probit framwork that credit information system reduces financial fragility and the adverse effect of the credit boom on financial stability. The findings of Leon et al. (2018) are like that of an earlier study (Buyukkarabacak & Valev, 2012) which found with panel data that credit information systems can reduce the likelihood of a banking system crisis.

Culture permeates the decision making process of bank officials and directly influences their risk-taking behaviour. Studies are of the view that the cultural tendencies that encourage frexibility, openess and risk-taking are positively related to the banks' risk taking in the intermediation process. Cultures which place premium on control and safety, on the other hand, are associated with minimal risking of bank officials (Nguyen, Nguyen, & Sila, 2019). In a related study, Hasan, Jackowicz, Kowalewski, and Kozlowski (2023) sought to investigate whether the cultural perspectives of the parent bank's board members influence the subsidiary bank's lending behaviour given the parent bank's board members' personality traits. They used the Hofstede cultural dimension of individualism, uncertainty avoidance, and indulgence as cultural indicators. They employed econometric models such as fixed/random effect, two-stage instrumental list square (to address issues of endogeneity and reverse causality) and hierarchical regression models to achieve the objectives.

Concerning the cultural dimensions, Hasan et al. (2023) also found that loan growth of foreign owned banks, adjusted to account for the median growth of domestic banks, increases in regimes where parent bank's board members show greater degree of uncertainty avoidance but lower degree of individualism and indulgence. They also found that the relationship between cultural values of the board and the lending behaviour of their banks depends on their gender, busyness, and ownership stake in their banks. Concerning the gender of the board, the study reported that, there was no difference between the orientation of females and males in regimes characterized by high degree of individualism and uncertainty avoidance. However, the authors found that in regimes with high degree of indulgence female board members have impact on the foreign-owned bank's lending behaviour.

The study by Hasan et al. clearly indicates that cultural values of parent banks' board have impact on the loan decisions of the board of the host countries' bank depending on the personal features of the board members. However, the paper failed to educate us on whether the decisions by the board members on loans that is based on their cultural orientation led to either bad quality or good quality loans which can affect the liquidity of the banks and therefore their stability levels.

In an earlier study, (Jackowicz, Kowalewski, & Kozlowski, 2022) examined whether parent country's cultural values influence the lending behaviour of bank subsidiaries of the host country during boom and crisis periods. The dataset comprises foreign banks from 46 countries which were operating in 47 countries. The period of their study was 1996 to 2018. They found that in times of crisis, the cultural values of the parent bank influence the lending behaviour of

the banks in the host country, stressing, that the national cultural values of the parent bank can ameliorate the negative impact of host country's bank lending.

Again, in the study of Jackowicz et al. (2022), the issue of the role of national culture dimensions in the relationship between financial innovation and banking system stability was not investigated. The intermediation activities of banks can actualize technological innovation which can also lead to productivity growth and eventually stability of the banks. On the other hand, excessive credit generation can boost liquidity in the economy which can also affect the stability of the price of banks' assets. In the end, excessive liquidity can increase the risk-taking behaviour of banks. In the quest of the banks to generate credit to support entrepreneurial activities, the current study sought to examine whether financial innovation in the forms of explosions in credit generation and financial transparency systems can promote banking sector soundness given the different cultural values of countries.

Banks strive on liquidity to the extent that a bank deprived of liquidity is a candidate for liquidation. Therefore, bank managers make attempts to boost their liquidity position through attraction of deposits and recovery of loans. However, Boubakri et al. (2023) found for 66 countries over the period of 2001 and 2014 in an instrumental variable framework that national culture dimensions of individualism, uncertainty avoidance and power distance influence the liquidation creation of banks in the 66 countries. Essentially, their study showed that high levels of individualism can boost liquidity creation of banks. Their findings were distributed across income groups so that the positive effect of individualism is stronger in developed countries than developing countries. Their study tends to suggest that income groupings

peculiarities are essential in unearthing the impact of national culture on banking system soundness.

However, the authors did not examine whether the boost in liquidity of banks due the national culture dimensions can resort in banking system instability. They did not also investigate the effects of the explosion in credit to the private sector on the banking system stability given different cultural values of countries. In addition to controlling for different income clubs globally, this thesis also examined the impact of national culture dimensions in the relationship between financial innovation and bank stability for 107 countries. The thesis also examined whether national culture dimensions play a role in the channels through information sharing systems, meant to improve financial transparency and outreach, translates into banking system soundness.

Based on the literature reviewed, works on the impact of national culture on bank stability have received little attention. There is yet to be a study that examines the network relationship between bank innovation, technological innovation, national culture, and bank stability. This study fills these gaps.

Table 2.1 Summary of Empirical Review

Islam, Ebenezer, Sobhani, & Shahriar (2020).	The effect of product market competition on the stability and bank capital ratio of Southeast Asian commercial banks was investigated.	System GMM dynamic panel data estimation technique	Market power has a strong and positive impact on regional bank stability.
Zins, & Weill, (2018).	The impact of bank competition, concentration, regulation, and national institutions on individual bank fragility was investigated. It was investigated how competition influences the loan supply reaction of Chinese banks to monetary policy via the bank lending channel, and whether this reaction differs across bank types. The relationship between foreign ownership type and	Cost efficiency estimation technique - Stochastic frontier approach Multivariate regression method- One-step model of Battese and Coelli (1995)	Pan African banks have greater efficiency than domestic banks, either privately owned or state-owned,
Boubakri, Mirzaei, & Samet (2017).	It was investigated whether the prevalent national culture played a role in determining bank performance during the recent financial crisis.	Panel Ordinary Least Squares Two-stage least squares	Uncertainty avoidance, collectivism, and power distance induced bank performance during the financial crisis
Dwumfour (2017).	Examined the determinants of banking stability in Sub-Saharan Africa	Ordinary Least Squares-Panel Corrected Standard Errors (OLS-PCSE), the Fixed Effects (FE) regression and the System-Generalized Method of	During financial crises, the level of competition improves bank stability.

		Moment (SYS-GMM)	
Yang, & Shao (2016).	Examined how competition influences the loan supply reaction of Chinese banks to monetary policy through the bank lending channel and test whether this reaction differs in heterogeneous bank types	Arellano and Bond (1991) Generalized method of moment –type estimator	Financial fragility results from a more concentrated banking environment.
Fu, Lin, & Molyneux (2014).	Examined the impact of bank competition, concentration, regulation, and national institutions on individual bank fragility	Instrumental variable technique with GMM estimator	Financial fragility results from a more concentrated banking environment. Bank competition induces bank's risk exposure

2.5 Measurement of Variables

This section of the review describes how the key variables, bank innovation, bank stability, and national culture, were conceptualized and used in the study. The details of the measurement are provided in the subsequent sections.

2.5.1 Evaluation of Bank Innovation

The Bank of International Settlements (2005) classifies financial innovation into price-risk-transferring innovations, credit-risk-transferring instruments, liquidity-generating innovations, credit-generating instruments, and equity-generating instruments. Similarly, Tufano (2003) also classifies financial innovations as product, process, or financial system/institutional innovations (Tufano, 2003). Laeven, Levine, and Michalopoulos (2015), as well as Idun and Aboagye (2014) and Idun (2021), used the speed with which a country adopts a credit

information sharing system as a measure of financial innovation. Finally, institutional innovations are changes in the financial system or the emergence of a new financial institution because of regulation. Laeven et al. (2015), Idun et al. (2014), and Idun (2021) used credit disbursement growth as a measure of financial innovation to capture financial intermediation innovations.

To capture the infrastructure for technological innovation diffusion in this study, the growth in mobile or cellular phone subscriptions was used. Following Leaven et al. (2015), Idun et al. (2014), and Idun (2021), the researcher used the growth in bank credit to the private sector (to capture innovations in banking system intermediation) and the speed with which a banking system adopts private information sharing systems as additional measures of bank innovations. Finally, to capture electronic cards in the banking system, the study relied on the ratio of broad money to narrow money to measure financial innovation by following Qamruzzaman, Jianguo, Jahan, and Yingjun (2020).

2.5.2 Bank Stability Metrics

Bank stability is defined as a bank's ability to withstand shocks due to its strong liquidity or capitalization. Bank stability in terms of insolvency risk is measured by value-at-risk and expected shortfalls. The capital assets pricing model (CAPM) can also be used to determine the risks of individual banks by regressing the bank's expected return by the market return of an index. These measures are recommended by Basel II and Basel III, but because they are market-based measures, they are inapplicable to unlisted banks. Accounting-based risk measures can be used by unlisted banks. Some studies have used the ratio of non-performing

loans to total assets and variations in the z-score to proxy bank stability or the likelihood of failure. According to Haldane (2009), traditional accounting measures fail to capture the downside risks of banks during financial crises - to capture the interdependence of banks in a banking system and the contagion effect of systemic risks.

As a result, in the post-2007/2008 crisis period, researchers' attention has been drawn to the use of measures that capture the rippling effect of a bank's failure on systemic risk. Because some countries lack stock exchanges, which implies that their banks are unlisted, the study will use the parsimonious z-sore, which relies on regulated accounting data in its estimation, as a proxy for bank stability to maintain consistency in measurement. The standard z-score is calculated as:

$$Z - score = \frac{ROA + \left(\frac{Equity\ capital}{Total\ assets}\right)}{SD(ROA)} \qquad (2.1)$$

where ROA is a bank's return on assets and SD(ROA) is the standard deviation of ROA.

The numerator represents the bank's buffer to withstand unfavorable conditions such as a bank run or insufficient deposits, while the denominator reflects the variability of the bank's earnings. The higher the numerator, the better a bank is positioned to continue operating in the aftermath of a crisis. Given the volatility of its earnings, a bank with a higher equity-capital base is considered more stable. A higher z-score indicates that a bank is less risky, and vice versa.

In the empirical studies, various z-score variations were used. The overall sample standard deviation was used as the denominator in some studies, and the ROA and equity-assets ratio were used as the numerators in others (Laeven & Levine, 2009; Cihak & Schaeck, 2007; Beck & Laeven, 2006). Other authors estimated the z-score using mean figures of ROA, equity-to-total assets, and the standard deviation of ROA (Bertay, Demirguc-Kunt & Huizinga, 2013). However, the denominator in their z-score equation is time-invariant, which may not capture the risk profile of banks over time. This problem can be reduced by estimating the z-score with higher frequencies of the variables in equation (1). However, because it is difficult to obtain bank data with higher frequencies, the study cannot use higher frequency data. Alternatively, the rolling window method can be used to estimate the z-score. The equidistant time-variant standard deviation of the ROA is used as the denominator in the rolling window model, as follows:

$$Z - score = \frac{ROA + \left(\frac{Equity\ capital}{Total\ assets}\right)}{RSD(ROA)} \tag{2.2}$$

where RSD(ROA) is the rolling-window standard deviation.

Equation (2) enables us to assess risks more frequently to determine the risk profile of a bank. Thought existing studies have resorted to the use of the rolling approach of estimating the denominator or the numerator (Berger, Goulding & Rice, 2014; Delis et al., 2012; Yeyati & Micco, 2007; Boyd et al., 2006) the rolling-time-varying score does capture the importance of a single bank in inducing systemic failure in the banking system. Furthermore, there is also no consensus on the acceptable rolling window period as different authors have used different windows. Li, Tripe, Malone, and Smith (2020) extended the conventional z-score by

estimating the risk-adjusted z-scores by using risk-weighted assets in place of balance sheet asset and tier 1 capital instead of equity capital. Risk-adjusted z-scores are lower than the conventional z-scores and are more stable thereby providing a less volatile estimation of bank stability, hence its use.

In this study, the researcher employs the various measures of the z-score discussed above. Also, to capture the importance of a single bank in causing systemic risk, the researcher adopted approach by Li et al. (2020) that estimates the z-core by subtracting the z-score of each bank from the aggregated z-score of all banks in the system. However, the study will explore the rolling window version as well as the risk-adjusted version recommend by Li et al. (2020) of the rolling window to average all the benefits associated with those modifications and minimize their drawbacks. The approach is represented as:

$$z-score=\left[\frac{\sum_{1}^{n}\frac{ROA+\left(\frac{Equity\ capital}{Total\ assets}\right)}{SD(ROA)}}{n}\right]-\left[\frac{ROA+\left(\frac{Equity\ capital}{Total\ assets}\right)}{SD(ROA)}\right] \quad (2.3)$$

2.5.3 Measurement of National Culture

The cultural dimension of Hofstede was relied upon as the measure of national culture. Hofstede (2001) classifies cultural dimensions into six: power distance, individualism/collectivism, uncertainty avoidance, masculinity/femininity, long-term orientation/short-term orientation, and indulgence/restraint are examples of cultural dimensions (see Minkov & Hofstede, 2014; Minkov & Hofstede, 2010).

2.6 Some Stylized Facts

The global banking system experienced arguably worse turmoil during 2007/2008 Global Financial Crisis (GFC). The GFC destabilized many economies and reignited the call for macroprudential policies by the banks to avert such catastrophes in the financial systems. The crisis was mainly attributed to the credit boom in the residential and mortgage market, where an unchecked proliferation of sub-par mortgages overwhelmed the financial market due to financial innovation-securitization of fewer quality mortgages. Figure 2.7 is a scatter plot of the relationship between the average growth in credit and the average bank stability for 107 countries globally. The Figure shows that the credit boom positively affects bank stability for the period 2005 and 2017. However, the rising trend line shows a very weak correlation between the growth in credit (financial innovation) and bank stability. The result suggests that the credit boom alone might not be the cause of the global economy's financial instability. In this study, we explore whether national culture dynamics can be confounding factors in the stream through which financial innovation can induce bank stability.

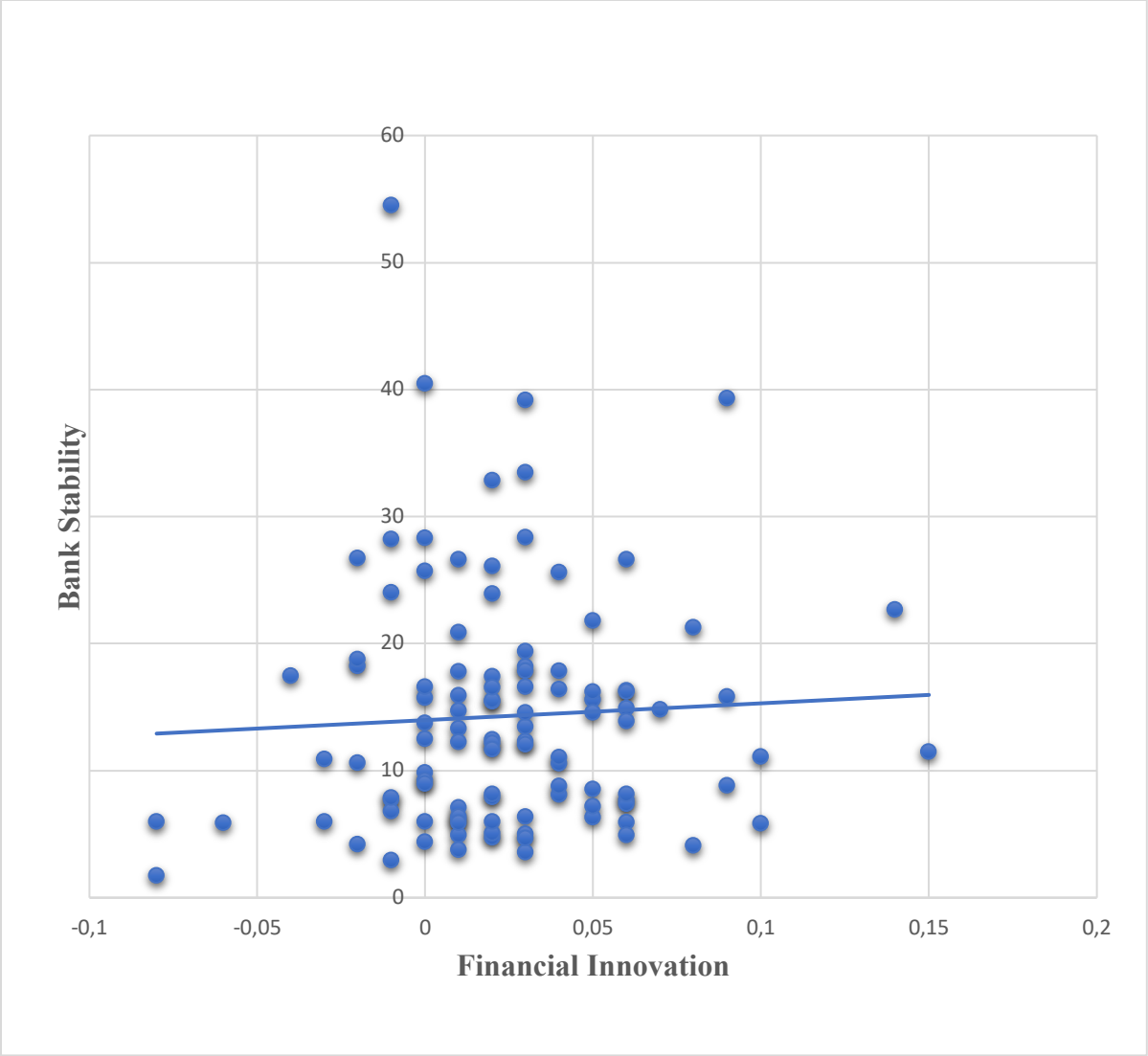


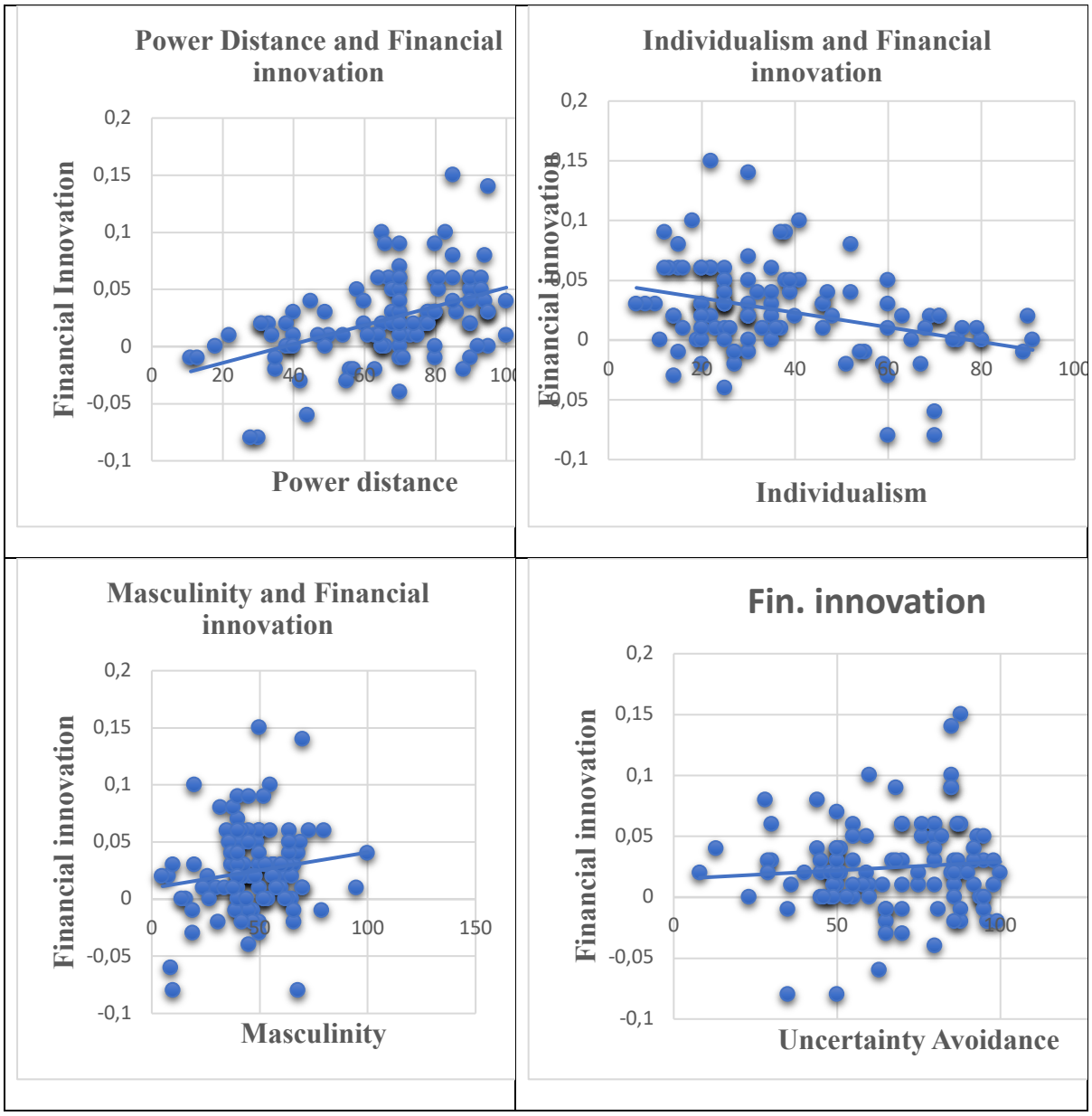
Figure 2.7 Financial innovation and bank stability. **Source: Author (2022)**

On the other hand, Figure 2.8 explores the relationship between the national culture factors and financial innovation. Starting with power distance, the figure shows that power distance has a positive correlation with financial innovation, indicating that power distance can lead to a boom in credit into productive sectors. Similarly, Figure 2.9 indicates that power distance has a very flat positive effect on bank stability (measured by the z-score). In most economies under investigation, the distribution of credits into sectors can be influenced by the rate at

which authority, which can be regulatory culture, motivate such distribution. Such regulated societies can motivate bank managers to channel credits into productive sectors to cause financial stability.

Figure 2.8 shows an inverse correlation between individualism and financial innovation, which is unexpected. Based on the description of individualism earlier, it is expected that countries with a high level of individualism should be innovative. Therefore, bank managers in such countries should be expected to channel more credits to support technological innovation. Notwithstanding that, the results may also imply a dip in the growth in credit in countries with a high level of individualism (advanced countries) which may account for the positive correlation between collectivism and financial innovation. In Chapter Three, the thesis showed that credit growth is greater in lower-income countries (which are mostly collective societies) than in high-income countries. However, the relationship between individualism and financial innovation can be confounded by the lack of inclusion of policy factors in the estimation.

Figure 2.9 also shows a positive elastic correlation between individualism and bank stability which can mean that the restriction of credits in individualistic societies was done carefully to induce banking system stability. Later in the thesis, the researcher analysed the effect of financial innovation on bank stability, given the level of individualism among the sampled countries. The analyses are expected to throw more light on the possible confounding effect of individualism on the effect of financial innovation on bank stability.


Power Distance and Financial innovation
Financial Innovation
Power distance
Individualism and Financial innovation
Financial innovation
Individualism
Masculinity and Financial innovation
Financial innovation
Masculinity
Fin. innovation
Financial innovation
Uncertainty Avoidance

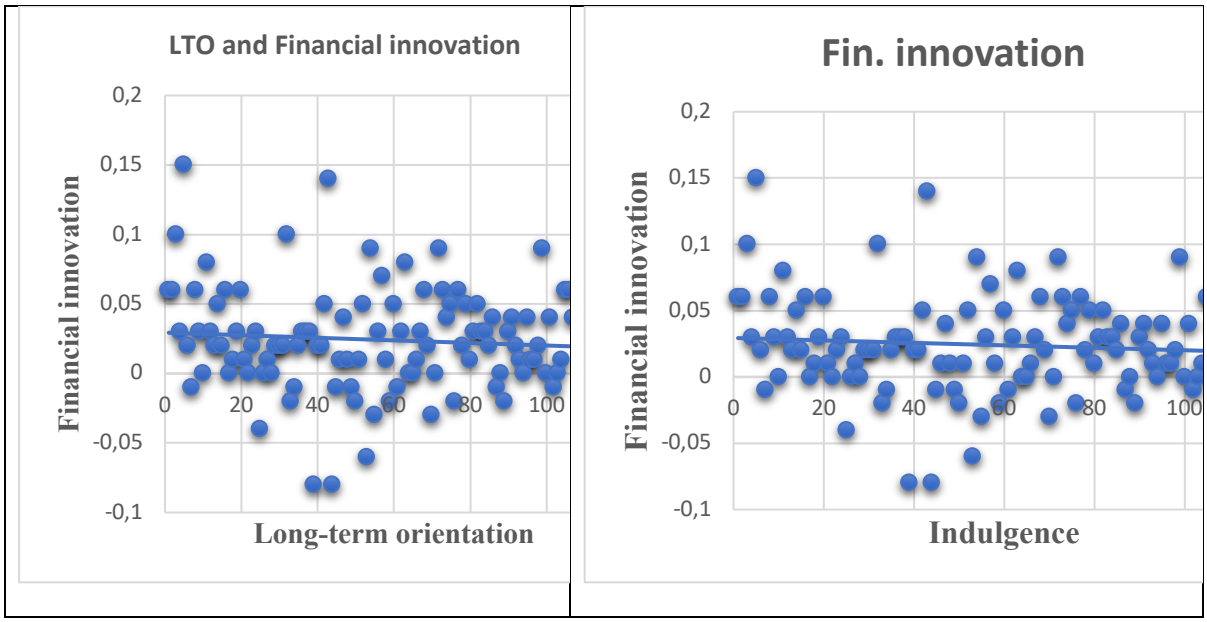
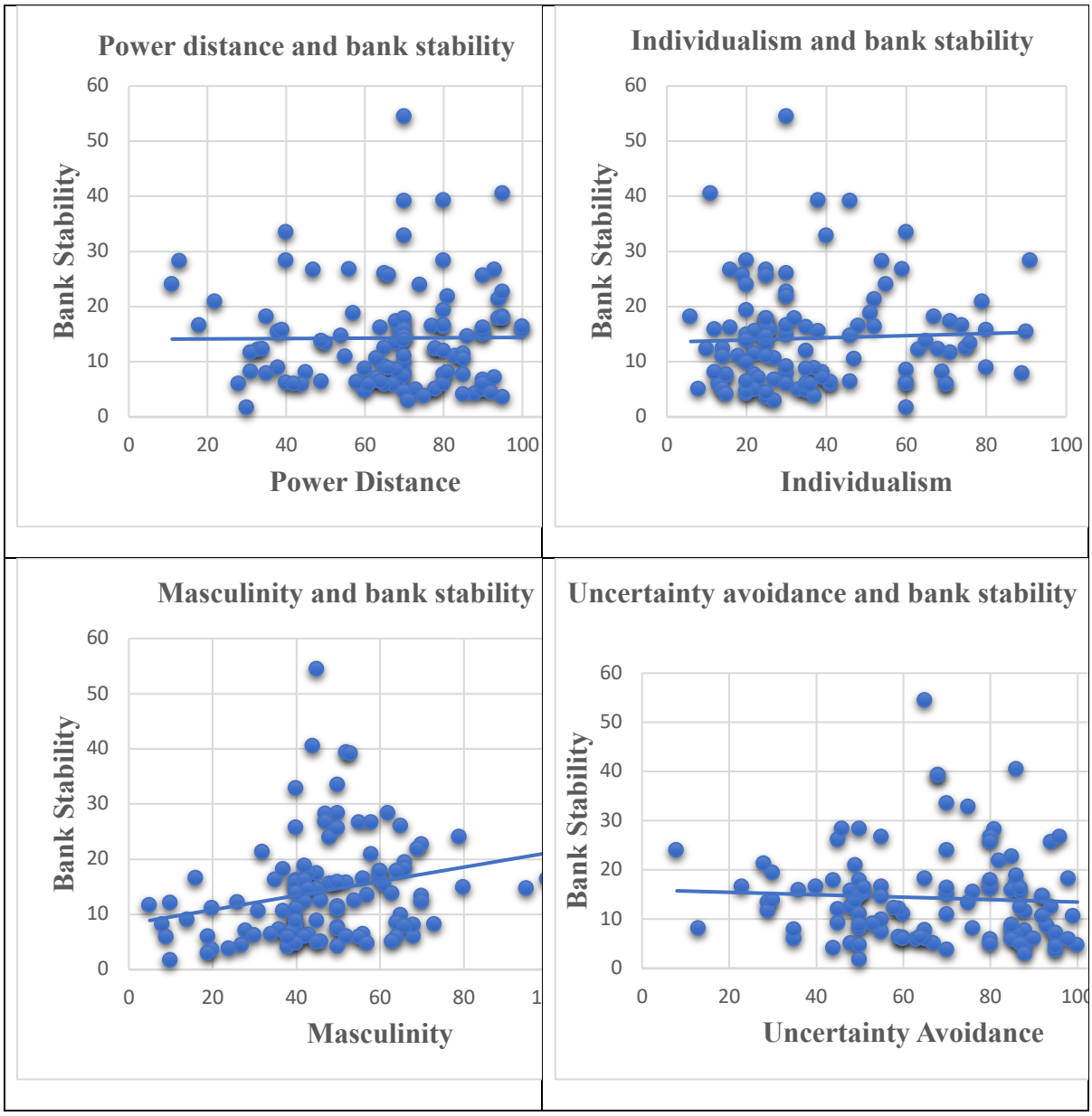


Figure 2.8 National culture dimensions and financial innovation. Source: Author (2022)

Generally, Figure 2.8 also shows that financial innovation rises with a long-term orientation, which presupposes that male-dominated tendencies in societies encourage managers of financial institutions to channel more financial resources into sectors. Men reflect toughness, aggressiveness, assertiveness, and materialism, which can partly explain why they may require more finance to support their orientation. It is expected that these inclinations of male-dominated tendencies of societies would increase their risk-taking behaviour, which, if not checked, can lead to bank instability. On the other hand, women are mostly tender, modest and careful, which may decrease their risk-taking behaviour.

Similarly, there is an elastic positive relationship between uncertainty avoidance and bank innovation, indicating that bank managers would channel more than proportionate financial resources into countries that increase their uncertainty avoidance level. Societies with high-level uncertainty avoidance love structured and regulated ways of doing things. Such societies

are more risk-averse and more likely to receive more funding and, at the same time, induce bank stability. Figure 2.8, however, shows that long-term orientation and indulgence separately have a constant correlation with financial innovation.


Power distance and bank stability
Bank Stability
Power Distance
Individualism and bank stability
Bank Stability
Individualism
Masculinity and bank stability
Bank Stability
Masculinity
Uncertainty avoidance and bank stability
Bank Stability
Uncertainty Avoidance

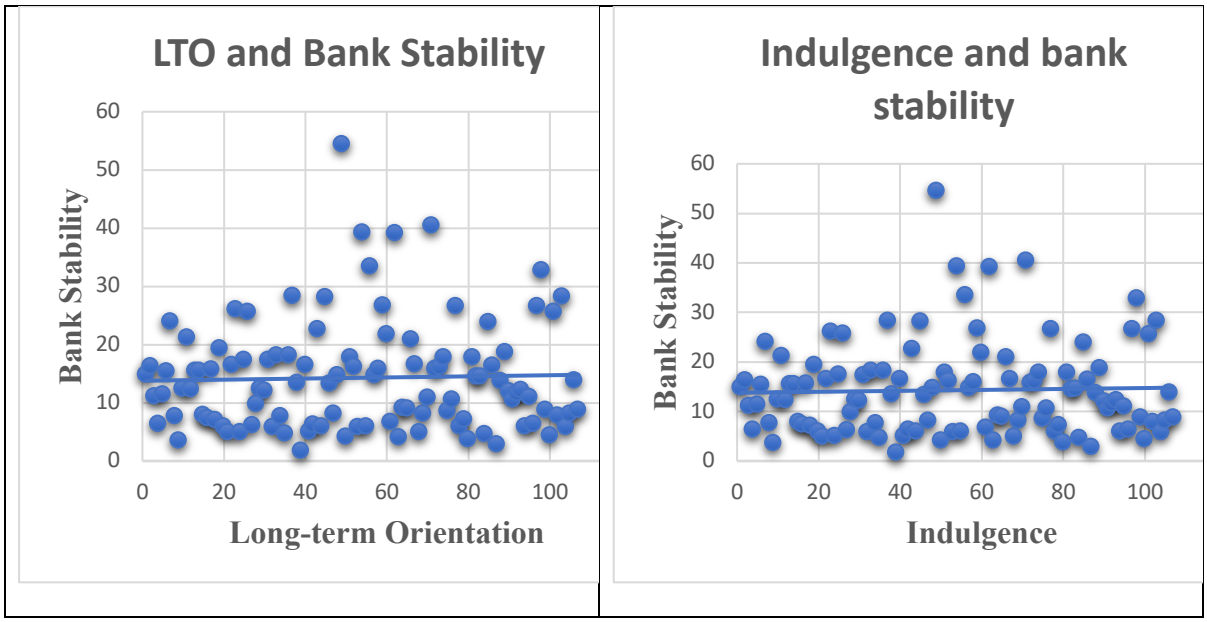


Figure 2.9 National culture dimensions and bank stability. Source: Author (2022)

2.7 Theoretical Model

Figure 2.10 provides a pictorial view of the theoretical relationship between the key variables under investigation. The framework dwells on the assumption that in the real world, firm finance their innovation using debt financing from the banking systems. This assumption has been overly simplified to the extent that firms also rely on equity financing to finance their new projects. However, the assumption is not misplaced because it cost firms to issue new equities more than borrowing from the bank, therefore, based on the cost of capital, firm would rather borrower from the credit markets.

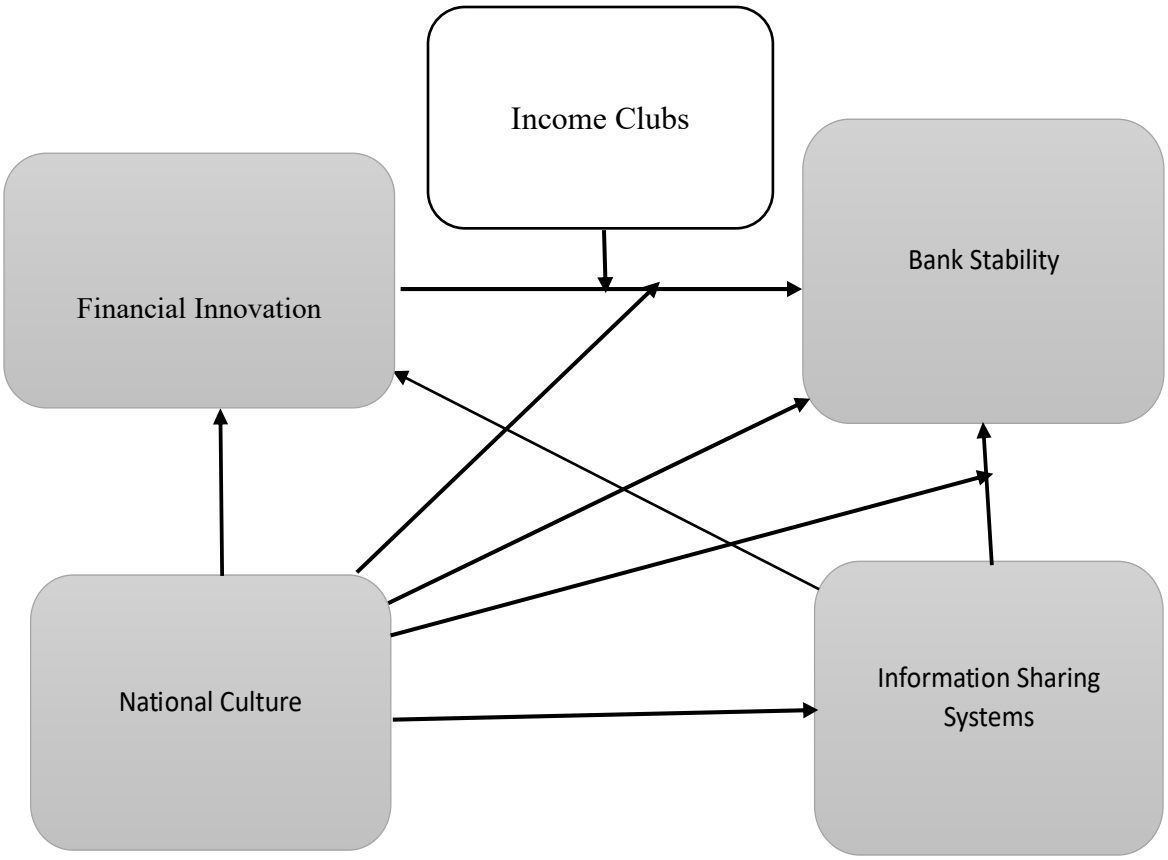


Figure 2.10: The theoretical framework based on the results of the theoretical review.

Source: Author (2023)

The second assumption is redundant but also useful and it states that firms would only go for new loans to finance new investments with positive Net Present Values (NPV). It follows that firm managers are rational and therefore would go for new loans only when the NPVs of their new projects exceed the cost of capital associated with the source of financing the projects.

The third assumption is based on King et el. (1993), Aghion et al. (2005) and Laeven et al. (2015) whose propositions stipulate that financial institutions or financiers employ state of the art technologies to screen borrowers to reduce adverse effects and moral hazards. With this

premise, the growth in credit to the private sector would accrue to only firms with positive NPV projects which are also viable enough to make good their loan obligations.

If the above three conditions hold, then the Schumpeterian growth models predict that new sources of finance from the financial institutions such as banks would be used to support technological innovation especially when the financiers themselves invest in new technologies such as information sharing systems to reduce information asymmetry and ATMs to boost credit distributions and accept more deposits. Thus, the value of financial innovation is tantamount to the value of technological innovations by firms and banks (Laeven et al., 2015).

The theoretical framework also shows that financial innovations lead to risk-taking of banks and therefore has implications on banking system stability. As financial innovation implies boost in credits to the private sector, it magnified economic activity and boost systemic liquidity. A boost in liquidity can affect asset pricing of banks since an increase in liquidity also implies reduction in the loan rates. On the positive side, a reduction in the loan rates would make it easier for firms to acquire loans cheaply and use them to boost their productivity. A reduction in the loan rates would also improve the loan quality of the banks since firms would be able to implement their viable project from the loan proceeds and pay their loan obligations. On the other hand, if the asset quality of existing banks is dubious and equity financing is constraints, some banks can engage in risky business in the face of keen competition in the banking sector.

In modern banking, credit information systems have been established to ameliorate the adverse risk-taking behaviour of banks. The system collects credit information of borrowers and shares them among networks of banks so that participating banks can assess the credit worthiness of the borrower before advancing loans. The use of information sharing systems can reduce loan impairment, improve asset quality, and boost liquidity of the banks to withstand systemic shocks. From the theoretical framework, the arrow pointing towards financial innovation explains that information sharing systems can generate quality new credits to support technological innovation by the private sector. Banks which employs the credit scoring systems can reduce non-performing loans and boost liquidity and thereby inducing banking system stability. Hence, the study proposes that information sharing systems can lead to boosts in the growth of credit to the private sector which in turns lead to the improvement in the soundness of the banking system. In the network of things, the cultural orientation of the society hosting a bank can play a role in how technological and financial innovation leads to banking system stability.

Culture connotes the values, norms, habits, work ethics, aspirations, and attitudes of a group of people in a defined territory. It defines what was acceptable, what is acceptable and what will be acceptable by members of a society. Even though culture can evolve due to globalization which has brought integrations in most sphere of life, there are certain enduring tendencies that define the idiosyncratic behaviour of a group people.

Culture influences the economic system and the behaviour of economic agents. For banks, the culture of the parent bank's country can be imported to the orientations of the bank in the host

country (Hasan et al., 2023). However, when it comes to adoption and diffusion of financial innovation, societal membership of the host country or the territory within which a bank operates plays a role. The cultural tendencies that encourage creativity and innovation is more likely to promote financial innovation which would in turn influence the risk-taking behaviour of banks and therefore bank stability (Boubakri et al., 2017). On the other hand, if the societal cultural orientation is in tune with orderliness and risk avoidance, the tendencies for members to engage in entrepreneurial activities would be limited which may have little impact on banks' risk-taking. To this end, this study proposes that (as shown by the arrow linking culture to bank stability directly or indirectly through financial innovation) that national culture of economies can induce or attenuate the effect of financial innovation on banking system stability.

In the same token, culture can make the existence of information sharing systems superfluous. If the culture of the nation encourages honesty as in some Scandinavian countries, the incentive for loan applicants to produce unreliable information to obtain loan would be minimal. This implies that banks would not have to spend fortunes to obtain information about borrowers before granting credits. They would not spend on expensive screening procedures before advancing loans and this would minimize the time and cost of loans. Only firms with viable projects would present their proposals for loans. Banks' asset quality would be top-notch which would improve their liquidity and therefore the soundness of the banking system.

In a society that encourages dishonesty on the other hand, financiers would employ the services of credit scoring institutions before allocating loans. The fees paid to the credit scoring agencies can sour up banks operating costs which can translate into greater cost of loans and

therefore, low banks' asset quality if the benefits of the information supplied by the credit scoring agencies does not supersede the cost of obtaining the information. Thus, this study proposes that national culture dynamics can moderates the relationship between information supplied by information sharing systems and banking stability.

2.8 Conclusions

The evidence in the extant literature suggests that researchers have in the aftermath of the global financial crisis be interested in the factors that induce the risk-taking behaviour of bank managers worldwide. By engaging in financial intermediation, the inclination of bank managers to increase their loan portfolio can have dire consequences on their liquidity position, especially when certain portfolios go bad. The Schumpeterian endogenous growth theorists suggest that financiers have developed rigorous processes that would ensure that increases in credit allocation can also promote the soundness of the banking sector if those credits go to productive sectors or countries which have developed their financial market to the extent of employing financial technologies to spot and deliver more credits to support technological innovation. In an opaque banking environment, the information asymmetry theorist asserts that financiers can use high-interest rates to discriminate among borrowers who can access funding for their projects. The other strand of the literature also says that national culture dimensions can affect bank managers' risk-taking behaviour since culture forms a dominant force in the determination of the actions of societal members with certain cultural inclinations.

This thesis makes important contributions to the extant literature in several ways. Firstly, by using a larger cross-sectional sample of 107 countries, the researcher finds enduring evidence that the credit growth to support technological innovation that would lead to banking system

stability globally does not depend on the income clubs of countries. This result runs inversely with the theoretical position by Aghion et al. (2005) and Laeven et al. (2015) that technically advanced countries are the only ones which can develop their financial markets to induce growth in credit to support technological innovation that would boost productivity growth.

Secondly, the thesis makes a case that bank managers use the national culture orientation of the countries they operate as collaterals to induce diffusion of credits into technological innovations that would lead to banking system stability. By this argument, the study stresses that excessive credit may not necessarily lead to financial instability (as has been suggested in the extant literature) if bank managers consider the national culture of the societies where they operate. Therefore, the study makes a strong argument that banking system innovation to generate more and sound credits should not be done without recourse to the regime's national culture if managers want to promote sound banking systems. The study, then, bridges the gap between those studies that address the relationship between financial innovation (in the form of credit generation) and bank stability and those on the effect of national culture and bank risk-taking behaviour.

The third major contribution of the thesis to the extant literature is the fact that the use of financial system innovation, such as the emergence of private credit bureaus, can reduce information asymmetry, which can, in turn, afford bank managers to advance more credits into productive sectors without inhibiting sound banking and therefore banking system stability. This assertion assumes that better information about borrower quality can reduce the loan rate,

providing entrepreneurs with more leverage for cheaper loans serviced to avoid loan impairment and, therefore, bank instability.

CHAPTER THREE

FINANCIAL INNOVATION AND BANK STABILITY AMONG PER CAPITA INCOME CLUBS

3.1 Introduction

To avoid risk escalation, banks are searching for viable niches in the credit market for credit advancement. As expected, sound financial management of banks implies that only innovative firms are more likely to secure more credits from the financial institutions (which employ innovative products and screening processes) to implement their risky but viable projects (King & Levine, 1993; Aghion & Howitt, 1992; Levine, 1997; Aghion, Howitt & Meyer-Foulkes, 2005; Laeven, Levine & Michalopoulos, 2015). Notwithstanding their willingness to transmit more credit to entrepreneurs, banks and other financial institutions can rely on financially repressive measures to avert adverse selection and moral hazards (Stiglitz & Weiss, 1981) unless the advancements in credit allocations would lead to increases in the net interest margin (Rousseau, 1998) and financial stability (Allen & Gale, 2004; Boyd & De Nicolo, 2005).

The contribution of this paper to the empirical literature is to the effect that technologically innovative firms are more likely to receive more credit to implement their ideas, and that, in turn, would have some beneficial impact on financiers in terms of financial system stability. This position is predicated on the relationship banking hypothesis that stipulates large banks have the most excellent chances to support entrepreneurs in the wake of crises so that in the future, they can partake in the successes of innovative firms (Petersen & Rajan, 1994, 1995; Benfratello et al., 2008; Kim & Park, 2016). The paper is also grounded within the Schumpeterian perspective that technological innovation attracts financial innovation which in turns brings about economic growth and financial stability (King et al., 1993; Aghion et al.,

2005; Laeven et al., 2015) and more profitability from increases in the net interest margin (Rousseau, 1998).

Several analyses have been undertaken to validate the assertion that technological innovations attract more credits from the financial system, which can affect banking system stability across the 107 countries from historical data between 2005 and 2017. The first batch of the analyses evaluates the impact of Laeven et al. (2015)'s definition of financial innovation on the z-scores of banks for the sample countries. In that evaluation, we found a strong positive impact of financial innovation on the z-scores of the countries, signifying that growth in credits to support the entrepreneurial activities of firms induces the financial stability of banks across the globe. However, the first batch of the analysis did not report on the differences in the country's per capita income.

Therefore, the second cycle of the analyses incorporated differences in income groupings in 107 countries. The Schumpeterian view and the endogenous growth theory stipulate that a higher level of financial development is associated with technological innovations that lead to a higher per capita income for the world's technological leaders (See Aghion & Howitt, 1992; King & Levine, 1993; Aghion, Howitt, & Meyer-Foulkes, 2005; Laeven et al., 2015). The analyses show that low-income countries observe higher growth in credit to the private sector compared to high-income countries.

Whereas the growth in credit in low-income countries averaged 4% from 2005 to 2017, that of high-income countries averaged 1% over the period. Credit growth was 4% in upper-income

countries within the same period whilst lower-middle-income countries were 2%. The upper-middle-income countries recorded the highest growth of 4% of the sampled countries. The evidence shows that the growth in credit experiences a vanishing effect as the countries reach high-income status. By the same token, putting all countries together, the average growth in credit between low-income countries and other income clubs are almost the same.

Due to the above statistics, we assessed whether the impact of financial innovation on the z-score differs across income levels. We divided the observation across the World Bank's per capita income clubs. That is, high-income countries, upper-middle-income countries, lower-middle-income countries, and low-income countries. After that, the effect of financial innovation on bank stability for the income groups in a GMM framework was also analysed. Unlike the earlier result, there was not enough evidence that the impact of financial innovation on bank stability differs across the various per capita income clubs. This means financial innovation strongly impacts bank stability regardless of income disparities between countries. The evidence remained the same even when ATM coverage was used as an alternative measure of financial innovation.

The subsequent section discusses the relevant literature on the issues analysed, the methods used, discussion of the empirical findings and suggestions and recommendations for future actions.

3.2 Literature Review

Financial innovation is the initiation and application of ideas to develop (or improve) financial products, processes, organisations, markets, and technologies to derive benefits such as revenue improvement, regulation circumventions, reduction in risk, and reduction in costs. We can deduce that the drivers of financial innovation are reduction in costs (e.g., the influx of mobile phone banking to help reduce the cost of employing more tellers) and risk diversification as in the emergences of derivatives such as futures and swaps to help investors lock in an interest rate to hedge their risk of interest rate volatility.

The use of technology in digitalised financial services has also boosted customer services in most financial institutions. Digitalised financial services have also induced financial inclusion in most countries (Global Financial Development Index, 2017). In Africa, for example, the proliferation of mobile money has massively accommodated the informal sector into the formal financial systems, which has dramatically improved financial inclusion. Technological innovation driving financial innovation has generally simplified financial transactions and reduced transaction time and cost. Technological innovation is also enhancing and boosting the payment system with the emergence of credit and debit cards, cryptocurrency, and online payment outlets.

To ensure the stability of the financial systems, banks are employing technology to screen borrowers to avoid loan impairment. The emergence of a credit reference bureau that stores and retrieve information about borrowers is helping to prevent the asymmetry of information in lending, which in turn assists in allocating credits into productive sectors (Büyükkarabacak & Valev, 2012; Kusi, Ansah-Adu, & Owusu-Dankwa, 2015). New financial reporting systems

such as the institution of the International Financial Reporting Standards (IFRS) are helping to improve firms' credibility to access more funds from the global financial markets to implement their new projects. The new accounting standards (IFRS) are also meant to induce the inflow of foreign direct investment and encourage international portfolio diversification, which can reduce investment risks and influence infrastructural development (Laeven et al., 2015).

In terms of monetary policy transmission, financial innovations have been used to avert or reduce the adverse effect of interest rate volatility. By ensuring easy access to funds, financial innovations can also boost liquidity in the economy. If inflation is expected, financial innovations can stabilise asset prices and ensure financial stability (Kero, 2013). Financial innovations such as credit cards, cryptocurrencies and other electronic cards can boost the money supply of the economy and can therefore cause inflationary tendencies if their effect on output growth does not supersede their impact on monetary policy transmission into inflation.

The Schumpeterian perspective on endogenous growth views financial innovation as an avenue to induce technological progress. The proponents of the Schumpeterian growth theory suggest that financiers employ rigorous screening technologies to identify promising entrepreneurs to provide financial resources to implement innovative products (King et al., 1993; Levine, 1997; Laeven et al., 2015). According to Schumpeter (1911), technological innovation greatly contributes to productivity and economic growth.

Banks use several forms of innovation to scrutinize clients during the intermediation process (Laeven, Levine, & Michalopoulos, 2015) or to improve the provision of digitalised financial

services (Johnson & Kwak, 2012; Ozili, 2018). Some studies have used growth in the credit to the private sector to measure of financial innovation because it captures technological innovations by banks and sources of finance for new investments by firms (Laeven et al., 2015; Idun et al., 2014; Idun, 2021).

The Schumpeterian positions generally hold that financial innovation provides beneficial exchanges between firms and financial institutions. This is because, financial innovation induces more access to credit to finance firms' viable investment expenditure, thereby boosting growth in the real sector. Financial innovation can reduce adverse selections and moral hazards by improving screening processes and providing credits to only promising entrepreneurs. According to Stiglitz et al. (1981), reducing information asymmetry can reduce equilibrium interest rates and help allocate more funds to the private sector. Financial innovations can also help banks induce interest rates spread even at reduced lending rates by creating a more outstanding market of credible borrowers (Rousseau, 1998).

The influence of financial innovation on bank stability can also be seen from the various perspectives of the new industrial economists, which relate financial stability to the structure and conducts of financial institutions. The relationship bank hypothesis suggests that banks with market power can promote innovations by funding small businesses. The banks can leverage their size economy to spot and provide credit to relatively unknown firms to finance technological innovation (Kelley, 1990; Peteresen et al., 1995; Benfratello et al.,2008; Kim & Park, 2016). Allen and Gale (2004) also argue that large financial institutions with market

power can reduce their loan rates, thereby boosting credit availability to credible borrowers to avoid financial fragility.

Some recent empirical studies support the idea that banks with market power should lower their loan rates to increase access to finance and bank stability. Findings in the study of Liang et al. (2017) that used the stochastic frontier approach to examine how SME lending and credit guarantee affect Korean banks' efficiency in 14 banks from 2001 to 2010 supports this proposition.

Furthermore, Islam, Olalere, Sobhani, and Shahriar (2020) in a study conducted in South-East Asia from 2009 to 2017 reported that the Lerner index positively and significantly affects bank stability in Malaysia and Singapore. However, in the same study the authors found that there is a negative relationship between market competition and stability for Indonesian and Thai banks. Finally, the study did not find any evidence that competition promotes bank stability concerning Filipino commercial banks. The study by Islam et al. suggests that the relationship between bank competition and bank stability is not the same across are geographical locations.

Further findings the study by Islam et al. (2020) indicate that product market competition has a significant positive impact on capital ratios at banks in Malaysia, Singapore, Indonesia, and Thailand. In contrast, the relationship between product market competition and the capital ratio is negatively significant at Philippine banks. This empirical study has significant supervisory and regulatory implications in the ASEAN banking industry, particularly in developing and emerging markets. The study backs up the competition-stability argument, arguing that banks

in more competitive markets should maintain a higher capital ratio to absorb unexpected losses. Using recent financial data from emerging and developing economies, the study confirmed that there is a strong link between product market competition, stability, and capital ratio.

Vo, Nguyen, and Van (2020) investigated the relationship between financial inclusion and financial market stability using a dataset of 3071 Asian banks from 2008 to 2017 and reported that banking sector stability and resilience are achieved when banks provide access to banking facilities. The authors also found that bank diversification and bank stability have a stronger relationship in conventional banks than in Islamic banking systems. This assertion is supported by the findings in the study of Abuzayed et al. (2018). The authors also discovered that improving institutional quality and the macroeconomic environment is critical in avoiding bank insolvency. Similarly, Kim et al. (2016) examined the relationship between a bank loan to a financially distressed firm and technological innovation in Korean manufacturing firms using probit models. They discovered that a bank loan to a struggling company with a poor incentive system has no or little effect on innovation. Their paper also suggests that firms' innovation performance improves in a stable financial arrangement.

Proponents of the competition-induced-financial-stability, on the other hand, argue that banking system competition reduces financial repression and lead to lower loan rates to ensure capital accumulation to boost economic growth and financial stability, owing to a reduction in loan impairments (Pagano, 1993; Boyd et al., 2005). Similarly, Fu, Lin, and Molyneux (2014) in their study discovered that a highly concentrated banking environment can result in financial fragility. The authors discovered that bank competition increases exposure to bank risk in the

same study. It however reported when entry requirements for banks are made firmer, it supports bank stability whereas stronger deposit insurance schemes are associated with greater bank fragility. These studies suggest that information is essential in reducing banking system vulnerabilities when the banking system is competitive.

In related study, Yang and Shao (2016) found that competition in the banking sector results in an increase in loan advancements and is less responsive to monetary policies. Similarly, Bostandzic and Weiß (2018) also reported that large European banks appear to contribute more to global systemic risk due to the lower quality of their loan portfolios and their greater interconnectedness with the global financial system.

Furthermore, Zins and Weill (2018) contend that Pan-African bank penetration boosts bank efficiency. Finally, Dwumfour (2017) investigates the factors that influence bank stability in Sub-Saharan Africa. The study discovered that the level of competition improves bank stability during financial crises. Furthermore, the author discovered evidence favouring both the concentration-fragility and concentration-stability hypotheses by mediating the effects of regulations.

From the foregoing reviews, the existing research has not investigated how financial innovation influences bank stability across national income groups. The disparities in the findings on the causes of bank stability from the industrial economist's viewpoint suggest that there should be more empirical studies on the factors that promote bank stability. Furthermore,

researchers are yet to focus their attention on the impact of volatility in competition on bank stability.

The financial meltdown in 2007/2008 has also shown that financial innovation can induce systemic risk. Although securitization aided easier access to finance by firms and allowed for risk shifts, it brought in its wake the 'great moderation, which in turn induced systemic risk. The story about financial innovation concerning financial stability is not always good. Financial innovation can enhance diversification and risk-sharing. However, it can also lead to excess liquidity (due to a boom in credit), which can attenuate bank stability (Merton, 1995; Pagano & Volpin, 2010; Kero, 2013). This suggests that financial innovation that boosts credit is beneficial for bank stability up to some level, and after that level, financial innovation can be inimical to bank stability (Chen & Du, 2016). The indications are that the effect of financial innovation on bank stability is inconclusive and therefore requires further investigation.

Moreover, the empirical studies have not yet exploited how differences in per capita income across countries would impact the relationship between financial innovation and bank stability. It is crucial to examine the impact of income because high-income countries are more technologically endowed than low-income countries (Romer, 1990; Aghion & Howitt, 1992; Aghion et al., 2005; Laeven et al., 2015). However, the evidence from the empirical data we used in this paper shows that credit growth is much slower in high-income countries than in low-income countries which in turns has slower credit growth than upper and lower-middle-income countries for the period 2005 to 2017. This is irrespective of the fact that private sector credit allocation is about six times higher than that of low-income countries, two times higher

than that of upper-middle-income countries, and two-point six times higher than that of lower-middle-income countries. By analysing the impact of income clubs in the financial innovation and bank stability nexus, we will ascertain whether higher levels of financial innovation measured as the growth in credits (Laeven et al., 2015; Idun, 2021) is detrimental to bank stability. The examination would also help determine whether technologically endowed countries use financial innovation to improve bank stability than their less technologically endowed counterparts.

Although several financial institutions have digitalized their services, the financial sectors of most economies have seen an increase in some negative activities such as financial fraud. Similarly, liquidity risk management can be adversely affected by customer over withdrawals because of digitalization. Inadequate liquidity in the banking system which is not due to regulation can result in inadequate credit creation capacity by banks and thus reducing interest income and, eventually, the banks' profitability. The current study investigates the impact of technological innovation on improving the intermediation process and promoting banking system stability in 107 countries.

Per the foregoing literature review, there has not been much research into the relationship between bank innovation, technological innovation, and bank stability. The current study fills the abovementioned gaps by investigating how bank innovation, technological innovation, and influence bank stability. The investigations on the link between financial innovation and banking system stability across the income clubs is important since many nations are industrializing and changing their fortunes which can affect the liquidity positions of the

financiers. The income club that a country belongs to also define the level of technological advancement of that country. Countries which are technological leaders are more likely to innovate and therefore require more financial resources. The current paper enabled us to ascertain whether financial innovation driving by technological advancement of nation can be injurious to the soundness of the banking system.

3.3 Measurement of Financial Innovation

Financial innovation is one of the many concepts that do not have a single definition. Tufano (2003) defined financial innovation as new products, new processes, and new institutions. According to Bank for International Settlement as cited in (Abor, 2018), financial innovations can be credit-generating innovation which creates new sources of funds for firms to implement their new projects. Firms are inclined to use new sources of credits for their new projects and the reasons are not far-fetched. First, it takes time for firms to raise equity finance through the issue of share in the capital markets. Even for unlisted companies' meetings would have to held and cogent reasons given before shareholders would commit more funds to support entrepreneurial activities of the firm.

If shareholders agree to commit more funds into their firm, they would reasonably do so at a cost higher than the rate of return on investment in bonds and long-term loans. That would raise the cost of raising equity capital to support new projects' implementation. To avoid higher cost of new projects, firms would find it cheaper and timeous to seek credit from financiers when firms realize that the rate of return of the new project(s) supersedes the cost of credit during their capital budgeting process. The premise is that firms would not go for more finance if they do not have viable projects to implement.

According to King and Ross (1993) and later Aghion et al (2005) and Laeven et al (2015), to ensure that they do not give credit to bad borrowers, financiers employ screening technologies to advance more credits to only entrepreneurs with viable projects for implementation. Through the new screening technologies, the financial institutions would be able to support technological innovators and technological adopters who would advance productivity growth to induce per capita income convergence between the societies that improve their level of financial development and the world technological leaders (Aghion et al, 2005). Laeven et al (2015) also posit that countries that can induce financial innovation in the form of growth in the credit to the private sector can induce their per capita income convergence to the level of the world's technological leaders.

Accordingly, based on the theoretical foundation in King and Ross (1993), Aghion et al (2005) and Laeven et al (2015) financial systems innovation has been defined as the growth in credit to the private sector to finance technological innovations by entrepreneurs. Apart from the above studies, Idun and Aboagye (2014), Bara and Le Roux (2016) and Idun (2021) used the growth in credit to the private sector as a measure of financial systems' innovation. Because the study considers financial systems globally, we followed the earlier authors and measured financial system innovation by the growth in credit to the private sector as a share of gross domestic product (GDP).

There are alternative definitions of financial innovation in the extant literature. Some have used expenditure on research and development as a measure of financial innovation. While results on R&D are crucial for the idea generation of new projects, the actual expenditure is often

considered as sunk cost and are not treated as the investment in the new projects. Even if R&D is considered as independent project, firms still require extra funds from the financiers to finance R&D activities. For financiers, they would only innovate in their screening processes only when such a technological innovation would enhance financial intermediation by reducing the risks of asset impairment and ensuring that credit goes to entrepreneurs with credible projects for implementation to boost productivity growth.

Financial process innovations such as the electronic cards, automated teller machines and internet banking are meant to improve financial service delivery but not boost productivity growth or reduce systemic risks (Johnson & Kwak, 2012). Ansong et al (2011) also found for Ghana that financial innovation in the form of electronic cards, ATMs, etc. encourages more withdrawals than financial savings which can adversely affect the liquidity position of financial institutions. However, as robust check, the current study also used ATMs coverage of the countries to measure financial innovation in the form of financial inclusion.

3.4 Methods

Country-level data was obtained from the Global Financial Development Database (GFDD) (2019) and the World Development Database (2019) for 107 countries. The study included 107 countries because these are the countries that have data on the six national culture dimensions and other variables in the study. The inclusion of large cross-sections of countries (which is unprecedented) also facilitated the decomposition of the sample into income clubs to examined how income and technological advancement can influence the bank stability channels of financial innovation. The panel period is 2005-2017 since data on most of the variable from the start from 2005 and end in 2017.

The dynamic generalised method of moment (GMM) analytical model is used to test the hypotheses of this study. The system GMM estimation technique is used because it is efficient for panel data structures with larger cross-sectional dimensions relative to the time-series dimension. In this, we are using 107 countries against 13 years of time series dimension. The dynamic GMM estimator takes the first differences of the variables and can remove unobserved country effects. It is effective when instruments that correlate with the independent variables but are uncorrelated with the error term are used. We used the lags of the respective independent variables as instruments because the lags have a high correlation with the level variables.

However, to achieve a reliable result the instrument used must be sufficient and at the same time uncorrelated with the residuals from the regression. To verify whether the instruments are uncorrelated to the error term, we performed the Sargan's J-statistics test, which tests the hypothesis that the instruments are uncorrelated with the error term. This hypothesis is rejected when the p-value of the test is less than the 5% significant level signifying that the instruments are correlated with the error term and therefore the instruments are inefficient in addressing endogeneity issues.

Based on the theoretical framework in Chapter Two of the thesis (page 78), the system GMM method is operationalised for our purpose as follows:

$$\Delta BS_{it} = \beta_1 \Delta BS_{it-1} + \beta_2 \Delta GDP_{it} + \beta_3 \Delta INF_{it} + \beta_4 \Delta MOB_{it} + \beta_5 \Delta TRADE_{it} + \beta_6 \Delta BC_{it}$$
$$+ \beta_7 \Delta FI_{it} + \sum_{j=2005}^{2017} \beta_j D_t + \Delta \varepsilon_{it} \qquad (3.1)$$

where BS is bank stability which is measured by the z-score; FI is financial innovation which is measured by the growth in credit to the private sector (FIN) and ATM penetration; GDP is the national income per capita; and INF is inflation to control for the level of price stability. MOB is cellular mobile phone penetration measured as the number of mobile phones per 100 of the population, our measure for the technological infrastructure for technological innovations in banks. TRADE is the level of trade openness measured by the exports plus imports as a share of GDP; BC is the level of bank concentration measured by the market share of the top four banks in a country; D represents period/time dummy; ε_{it} are the residuals or the error term; it shows that the data is a panel made up of countries, i, and time in years, t; $\beta_1 \; to \; \beta_7$ are the parameters to be estimated and β_j is the coefficient of the time dummies.

Equation (3.1) was estimated for the overall observations of multiple 107 countries and 13 years. According to World Bank's 2019 classification of countries into income clubs, we also created sub-samples for the various per capita income groups. That is, we made samples for high-income countries (HIC), upper-middle-income countries (UMIC), lower-middle-income countries (LMIC) and low-income countries (LIC). We then applied the dynamic GMM estimations on all the sub-samples to ascertain whether the impact of financial innovation on bank stability differs across income clubs. The description of the data is presented in Table 3.1.

3.4.1 Description of the Data

Table 3.1 contains the essential statistics about the dataset. The first panel of the table has the summary statistics of the high-income countries. Concerning the variables of concern in this study, for every 100,000 people in high-income countries have about 85 automated teller machines either to deposit money or to withdraw money as against about 44 in upper-middle-income countries, 18 in lower-middle-income countries and about 4 in lower-income countries. The statistics implies that technological innovation in the provision of banking services to induce financial inclusion is highest in high-income countries, followed by upper-middle income countries, lower-middle-income countries and low-income countries in that order. Thus, the higher a country's level of income the greater the possibility of the country being a technological leader (Aghion et al., 2005; Laeven et al., 2015).

Similarly, on the average, the share of private sector credit of GDP in high-income countries (93%) exceeds that of upper-middle-income countries (44%), lower-middle-income countries (35%) and lower-middle-income countries (14.4%). The preceding observations suggest that technological advancement, private sector credit allocation, and national income are intrinsically linked in the sense that countries with the highest level of technological application in financial service delivery are also members of the club of countries that channel more credit into the private sector to stimulate investment.

However, the picture is linearly different regarding the growth in private sector credit, which is a criterion measure of financial innovation. Table 3.1, across the panels, shows that the average growth in credit in high-income countries is 1% which compares unfavourably with that of low-income countries (4%), upper-middle-income countries (4%) and lower-middle-

income countries (2%). This indicates a vanishing trend in the size of private sector allocation in high-income countries compared to that of low-income countries and the intermediate-income club countries. Though the size of credit to the private sector is highest in high-income countries, the growth in credit is lowest compared to other income clubs. This is an indication that financial resources are being channeled into the private sectors of emerging countries more at the faster rate than as the resources are channelled into the private sector of advanced countries.

Moreover, regarding bank stability, the z score (BS) shows that, on average, the banking system in lower-middle-income countries is more stable (mean BS=16.27) than that of high-income countries (mean BS=15.09) and the average of all nations (14.41). The income groups that recorded below-average bank stability levels are upper-middle-income countries (mean=13.38) and low-income countries (mean=7.79). These averages do not show clear linkages between income clubs and the level of bank stability but on the average high-income countries and middle-income countries appear to have above average level of banking system stability which also indicates slightly that the higher a countries income level, the higher is the stability of its banking system. These disparities motivated the researcher to examine the impact of financial innovation on bank stability to engineer specific policy directions regarding how bank stability can be improved.

Table 3.1: Descriptive Statistics for the Overall Sample and the Income Clubs

	All Countries								Lower-Middle-Income Countries						
	ATM	BC	FIN	INF	MOB	TRADE	BS		ATM	BC	FIN	INF	MOB	TRADE	BS
Mean	53.07	64.22	0.02	5.56	99.17	91.91	14.41	Mean	17.56	55.41	0.02	7.62	76.36	74.81	16.27
Median	44.12	62.90	0.01	3.59	104.32	76.21	12.64	Median	13.39	53.75	0.01	6.58	76.52	68.63	14.91
Maximum	228.87	100.00	0.75	254.95	251.77	442.62	63.41	Maximum	103.87	100.00	0.65	48.70	151.62	200.38	44.36
Minimum	0.00	20.85	-0.62	-60.50	0.54	20.72	0.02	Minimum	0.45	25.88	-0.37	-60.50	5.55	20.72	2.63
Std. Dev.	43.66	18.24	0.11	10.07	39.25	63.58	9.70	Std. Dev.	16.74	15.52	0.12	7.44	36.67	31.42	8.72
Skewness	1.25	0.14	0.60	13.00	-0.16	2.90	1.53	Skewness	2.65	0.69	0.76	-1.43	-0.03	1.03	1.04
Kurtosis	4.61	2.14	9.13	296.69	3.40	13.29	6.25	Kurtosis	12.10	3.45	6.73	28.58	2.12	4.31	3.80
Observations	1291	1346	1390	1355	1389	1325	1369	Observations	286	294	312	312	312	299	306
	High-Income Countries								Low-Income Countries						
	ATM	BC	FIN	INF	MOB	TRADE	BS		ATM	BC	FIN	INF	MOB	TRADE	BS
Mean	84.80	68.90	0.01	2.48	121.26	115.83	15.09	Mean	3.40	79.32	0.04	9.63	37.79	62.84	7.79
Median	72.45	67.48	0.00	2.09	117.48	86.35	14.14	Median	2.65	82.60	0.00	7.62	32.74	61.60	6.96
Maximum	228.87	100.00	0.43	15.40	251.77	442.62	48.52	Maximum	11.03	100.00	0.51	44.36	93.50	111.47	18.13
Minimum	27.58	29.95	-0.42	-4.86	34.77	24.49	0.02	Minimum	0.00	47.80	-0.27	-27.79	0.54	31.10	0.04
Std. Dev.	42.19	17.75	0.08	2.56	28.74	86.10	9.36	Std. Dev.	3.18	13.76	0.13	9.73	26.04	20.16	3.99
Skewness	1.17	-0.12	0.36	1.65	0.96	2.04	0.79	Skewness	0.85	-0.64	0.85	0.46	0.46	0.47	0.74
Kurtosis	4.03	2.18	7.49	7.53	5.96	6.76	3.31	Kurtosis	2.80	2.47	5.21	7.34	2.12	2.54	2.64
Observations	527	558	559	556	559	546	558	Observations	53	77	78	71	76	62	78
	Upper-Middle-Income Countries														

	ATM	BC	FIN	INF	MOB	TRADE	BS
Mean	43.81	61.37	0.04	7.44	97.89	77.20	13.38
Median	37.90	59.15	0.02	4.81	98.89	73.57	9.83
Maximum	185.32	100.00	0.75	254.95	180.49	203.85	63.41
Minimum	0.70	20.85	-0.62	-10.07	5.69	22.11	2.29
Std. Dev.	30.10	17.74	0.12	15.56	33.20	32.86	10.86
Skewness	1.48	0.29	0.20	11.12	-0.12	0.78	2.38
Kurtosis	6.14	2.27	10.73	163.00	2.89	3.53	9.50
Observations	425	417	441	416	442	418	427

BS is bank stability which is measured by the z-score; FI is financial innovation which is measured by the growth in credit to the private sector (FIN) and ATM penetration; GDP is the national income per capita; INF is inflation to control for the level of price stability; MOB is cellular mobile phone penetration measured as the number of mobile phones per 100 of the population, our measure for technological infrastructure for technological innovations in banks. TRADE is the level of trade openness measured by the exports plus imports as a share of GDP; BC is the level of bank concentration measured by the market share of the top five banks in a country, and PSC is the share of private sector credit to GDP.

3.4.2 Correlation Analysis

Table 3.2 reports the results of the correlation analyses between the pair of the variables. We see a negative relationship between ATM penetration and financial stability, signifying that increasing the use of ATMs in financial service delivery can injure bank stability. This can happen when ATMs are mostly used to withdraw money (Ansong et al., 2011) which can boost excess liquidity to affect asset prices due to resultant inflation or which can cause shortages in bank liquidity and therefore depletes the buffer of the banks to withstand systemic shocks.

Similarly, financial innovation measured by the growth in credit has a positive effect on bank stability. The correlation result means that a more significant amount of credit channeled to support technological innovation and entrepreneurial activities of firms can boost bank system soundness.

Table 3.2: Correlation Matrix

	ATM	BC	PSC	FIN	GDP	INF	MOB	TRADE	BS
ATM	1.00								
BC	0.01	1.00							
PSC	0.58	0.22	1.00						
FIN	-0.16	-0.01	-0.12	1.00					
GDP	0.55	0.26	0.58	-0.10	1.00				
INF	-0.30	-0.11	-0.34	-0.04	-0.31	1.00			
MOB	0.43	0.01	0.44	-0.12	0.49	-0.27	1.00		
TRADE	0.06	0.15	0.33	-0.05	0.47	-0.12	0.37	1.00	

BS	-0.07	0.01	0.03	0.00	0.14	-0.15	0.11	0.18	1.00

Table 3.2 also shows a positive relationship between income (GDP) and bank stability, indicating that financial stability in high-income countries can be higher than that of low-income countries. The relationship between financial innovation and bank stability appears very weak per the correlation analysis. However, the correlation results only show the bivariate relationships among the variables. For more comprehensive analyses between financial innovation and bank stability that include other policy indicators as control variables, this paper employs the dynamic GMM with period fixed effects. The results of the empirical study for the total observations and across income clubs are shown in Table 3.3.

3.5 Empirical Results

The relationship between financial innovation and bank stability is depicted in Table 3.3. The researcher conducted the estimation for two measures of financial innovation: the growth in the share of private sector credits and automated teller machine (ATM) penetration. The estimations in the first four columns used the growth in credit as a proxy for financial innovation, whilst the estimations in the last four columns used ATM coverage as a proxy for financial innovation. In both cases, the estimations were done for the overall sample and the samples for the income clubs (HIC, UMIC, LMIC).

As we see in the first column, financial stability is positively correlated with bank stability for the 107 sampled countries. This finding is consistent with the Schumpeterian model of stability (King et al., 1993; Petersen et al., 1995; Aghion et al, 2005, Laeven et al., 2015), which implies

that access to finance is critical for financial stability. The intuition is that by increasing access to finance, more businesses will implement their new and viable projects. The repercussions of a firm's ability to engineer projects are that the firms would earn higher returns which in turns make it easier for them to repay their loan obligations. Hence, high-quality loans would contribute to the banking system's stability.

The relationship between financial innovation and bank stability is stronger when considering upper-middle-income countries (UMIC). The third column of Table 3.3 (UMIC) indicates that financial innovation is responsible for 2.62 times improvements in bank stability in UMIC. The UMIC income group recorded the highest growth in the level of credit to the private sector. Our descriptive statistics (see Table 3.1) indicate that the average growth in credit to the private sector for the UMIC is 4%; only low-income countries recorded that same level of growth among the income clubs. Since we did not find any meaningful evidence regarding the effect of financial innovation and bank stability in the lower middle-income countries (LMIC), we can suggest that the results confirm the Schumpeterian view that financial innovation boosts per capita income which leads to greater stability of the banking sector (Aghion et al., 2005; Laeven et al., 2015). Table 3.3 also shows no meaningful evidence that financial innovation induces bank stability in high-income countries (HIC). The HIC is the club that recorded the lowest growth in credit to the private sector (1%). The results imply that a boost in credit to support innovation would induce bank stability so long as countries are not approaching their steady-state per capita income but are rather experiencing rising per capita income growth.

Using ATM, we did not find statistical evidence that financial innovation influences bank stability for the 107 countries. Similarly, financial innovation has no meaningful effect on bank stability in the LMIC, as shown in the eighth column of Table 3.3. However, financial innovation strongly impacts bank stability for the HIC and UMIC countries, as shown by the sixth and seventh columns in Table 3.3. The above results imply that high income countries are better positioned to use financial innovation to boost financial inclusion which would in turn induce the soundness of the financial system. The results again, confirms the perspective of the Schumpeterian models of financial soundness.

The normative explanation for the strong impact of financial innovation on bank stability gives credence to the view that high-income countries are technological endowed which enables them to generate resources to boost entrepreneurial activities by spotting and channeling funds into productive sectors (King et al., 1993; Aghion et al., 2005; Laeven et al., 2015). Since liquidity advancement to entrepreneurial firms is less risky, the asset quality of the financiers would improve and that would result in the soundness of the banking system. This explains the positive relationship between financial innovation and banking system stability especially when income levels are high.

Table 3.3: Financial Innovation and Bank Stability

	Growth in Private Sector Credit				ATM Coverage			
Eq Name:	ALL	HIC	UMIC	LMIC	ALL	HIC	UMIC	LMIC
Method:	GMM	GMM	GMM	GMM	GMM	GMM	GMM	GMM
Dep. Var:	BS	BS	BS	BS	BS	BS	BS	BS
BS(-1)	0.465***	0.411***	0.395***	0.540***	0.4216***	0.419***	0.299***	0.507***
	(0.022)	(0.009)	(0.017)	(0.032)	(0.0189)	(0.010)	(0.005)	(0.047)
GDP	0.000	0.000***	0.000	0.000	0.000	0.000	-0.001***	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)
INF	-0.0189	-0.455***	0.042**	-0.018	-0.002	-0.459***	0.150***	-0.028
	-0.0156	(0.029)	(0.017)	(0.016)	(0.012)	(0.030)	(0.010)	(0.017)
MOB	0.005	-0.008***	0.020***	0.015	0.010***	-0.011***	0.018**	0.021
	(0.004)	(0.002)	(0.002)	(0.008)	(0.004)	(0.004)	(0.008)	(0.020)
TRADE	-0.083***	0.016**	-0.037***	-0.022	-0.082***	0.013**	-0.053***	
	(0.007)	(0.006)	(0.006)	(0.013)	(0.006)	(0.005)	(0.003)	
BC	-0.104***	-0.098***	-0.107***	0.000	-0.111***	-0.091***	-0.103***	0.018

	(0.013)	(0.014)	(0.008)	(0.013)	(0.011)	(0.015)	(0.008)	(0.025)
FIN	2.163***	-0.775	2.620***	0.220				
	(0.352)	(0.715)	(0.441)	(1.155)				
ATM					-0.009	0.034***	0.053***	-0.084
					(0.008)	(0.006)	(0.020)	(0.064)
Observation	1058	455	313	248	981	428	296	228
Sargan	0.205	0.418	0.263	0.403	0.244	0.357	0.358	0.622
AR(2)	0.965	0.998	0.695	0.460	0.894	0.002	0.817	0.998
Instruments	72	43	30	23	72	41	30	23

***mean 1% significant level, **means 5% significant level and * means 10% significant level.

Furthermore, to examine the view that an excessive boost in liquidity that is fueled by an increase in credit allocation can result in financial crises (Merton, 1995; Pagano & Volpin, 2010; Kero, 2013), we introduced dummies for the period effect into the model and re-estimated equation 3.1. The analyses enabled us to ascertain the period within which a boost in financial innovation can be detrimental to banking sector stability.

Table 3.4 presents the empirical results on the relationship between financial innovation and bank stability. The second column (ALL) shows the results for all the 107 countries; the third column shows the results for high-income countries, the fourth column shows the results of upper-middle-income countries, the fifth column shows the results of lower-middle-income countries. For the observations, we could not obtain enough data points to estimate the relationship between financial innovation and bank stability for low-income countries and lower-middle-income countries. Instead, we combined the observations for low- and lower-middle-income countries to compare their results to those of higher-income countries. The results of that estimation are presented in column six of Table 3.4.

Concerning the significant results, like the results in Table 3.3, the lag of bank stability has a strong positive impact on the current level of bank stability. The outcome implies that the previous period stability level induces, as expected, bank stability. Similarly, for the overall sample, the per capita income level has a strong positive effect on bank stability, which implies that a higher standard of living for everyone is good for the banking system's stability. Also, for the overall sample, the level of bank concentration is inimical to bank stability which normatively implies that the conducts of large banks are not beneficial to bank stability.

Therefore, a more competitive banking system should be encouraged. This result is in line with the competition-stability perspective that bank competition, to the extent that it reduces the loan rates, can help allocate more credit to firms that can honour their loan obligations to induce bank stability (Boyd et al., 2005).

Financial innovation has a strong positive impact on bank stability for the overall sample, as shown in the first column. The result implies that the growth in credit to support new investments in firms induces the banking system's stability. Financial innovation has a desirable effect on bank stability since it helps channel credits to the economy's productive sector (Laeven et al., 2015). Financial innovation is also instrumental to financial stability when it directly affects banks' intermediation activities (Johnson & Kwak, 2012). Financial innovation can have a desirable effect on bank stability because it improves banks' liquidity and avert excessive risk-taking behaviour of banks (Merton, 1995; Pagano & Volpin, 2010; Kero, 2013). However, we did not find meaningful evidence that financial innovation causes bank stability in the HIC, UMIC, and LMIC countries and the combined low-income countries.

The second portion of the results shows the effect of the period dummies on bank stability. The study included the time dummies to examine whether event that caused structural changes in the economies can influence the results. Within the period under study (2005-2017) major events took place. For example, the 2007/2008 Global Financial Crisis can have a confounded effect on the results, if not controlled. The inclusion of the time dummies enabled the researcher to investigate the effect of major events in time on the dynamics under study. Interestingly, it was found that the period during the global financial crisis (2008) had strong

negative impacts bank stability. Financial innovation enhanced bank stability during the recovery period after 2008 (in 2009, 2010, 2012, 2013, 2015, 2016, and 2017). The result implies that the stimulus interventions employed by the various regimes to deal with the crises started yielding results in 2009. However, unlike the results in Table 3.3, the impact of financial innovation on bank stability vanishes when we introduced the period effects. The new development implies that time has a mediating effect on the relationship between financial innovation and bank stability. During crises periods, financial innovation has a dampening impact on bank stability. During regular periods, financial innovation induces bank stability.

Table 3.4: Relationship between Financial Innovation and Bank Stability

	Growth in Private Sector Credit				ATM Coverage			
	ALL	HIC	UMIC	LMIC	ALL	HIC	UMIC	LMIC
Method:	GMM	GMM	GMM	GMM	GMM	GMM	GMM	GMM
Dep. Var:	BS	BS	BS	BS	BS	BS	BS	BS
BS(-1)	0.286***	0.276***	0.265***	0.297	-0.084***	0.273***	0.228***	0.14
	(0.012)	(0.028)	(0.072)	(0.552)	(0.009)	(0.035)	(0.043)	(0.340)
GDP	0.000***	0.000	-0.001***	-0.003	0.000***	0.000	-0.001**	-0.002
	(0.000)	(0.000)	(0.000)	(0.005)	(0.000)	(0.000)	(0.000)	(0.005)
INF	0.003	0.312***	-0.025	0.016	0.024	0.258***	0.082	-0.092
	(0.008)	(0.070)	(0.094)	(0.096)	(0.017)	(0.082)	(0.144)	(0.154)
MOB	-0.002	-0.010	0.095***	0.211	0.003	-0.015	0.108***	0.255
	(0.004)	(0.008)	(0.023)	(0.327)	(0.003)	(0.009)	(0.029)	(0.298)
TRADE	0.010	0.012	0.051	-0.075	0.002	0.016	0.034	-0.037
	(0.006)	(0.019)	(0.068)	(0.188)	(0.008)	(0.021)	(0.076)	(0.156)
BC	-0.039***	0.044	-0.154**	0.019	-0.032***	0.053	-0.192**	0.107

		(0.005)	(0.070)	(0.075)	(0.213)	(0.008)	(0.069)	(0.088)	(0.306)
FIN		2.398***	-1.61	2.58	-8.661				
		-0.191	-1.183	-2.299	-10.387				
ATM						-0.014*	0.026	0.096	0.292
						(0.008)	(0.021)	(0.050)	(1.251)
	2007	-0.036	-0.266	-1.348***	-0.789	0.135	-0.561**	-1.919***	0.405
		(0.076)	(0.242)	(0.488)	(3.102)	(0.079)	(0.242)	(0.697)	(0.913)
	2008	-0.949***	-2.737***	-0.786	-0.04	-0.762***	-2.479***	-1.942**	-3.351
		(0.121)	(0.217)	(0.610)	(1.005)	(0.168)	(0.258)	(0.900)	(4.644)
	2009	1.136***	2.998***	-0.29	-0.385	0.567***	2.959***	-0.679	-3.047
		(0.132)	(0.390)	(0.668)	(1.187)	(0.159)	(0.435)	(1.675)	(4.163)
	2010	0.296***	0.203	-0.630	-0.292	0.598***	0.212	-1.259***	-3.855
		(0.085)	(0.242)	(0.416)	(0.866)	(0.073)	(0.234)	(0.459)	(5.708)
	2011	-0.111	-0.878***	-0.079	-0.167	0.117	-0.809***	-0.454	-2.000
		(0.079)	(0.169)	(0.432)	(0.466)	(0.078)	(0.201)	(0.415)	(3.071)

2012	0.206***	0.995***	-0.591**	0.025	0.313***	0.920***	-0.494	-1.714
	(0.049)	(0.144)	(0.274)	(0.461)	(0.056)	(0.168)	(0.416)	(1.985)
2013	0.168***	0.538***	-0.701***	0.645	0.276***	0.463***	-0.932**	-1.229
	(0.055)	(0.168)	(0.255)	(1.132)	(0.071)	(0.164)	(0.409)	(1.685)
2014	-0.008	0.111	0.62***	-0.739	0.158***	-0.003	0.185	-0.86
	(0.048)	(0.124)	(0.209)	(0.647)	(0.048)	(0.145)	(0.383)	(2.171)
2015	0.573***	1.344***	0.836	-0.159	0.614***	1.148***	0.535	-1.408
	(0.056)	(0.243)	(0.439)	(0.590)	(0.078)	(0.263)	(0.642)	(1.172)
2016	0.323***	0.296	0.516	0.544	0.382***	0.366	0.592	-0.799
	(0.051)	(0.244)	(0.279)	(0.620)	(0.053)	(0.268)	(0.335)	(1.305)
2017	0.286***	-0.395	-0.244	0.481	0.394***	-0.502	-0.34	-0.098
	(0.060)	(0.448)	(0.404)	(0.655)	(0.055)	(0.443)	(0.517)	(0.710)
Observations:	1058	455	313	248	981	428	296	228
Sargan Test (Prob)	0.081	0.089	0.822	0.162	0.281	0.160	0.899	0.162
AR(2)	0.277	0.103	0.967	NA	0.023	0.445	NA	NA
Instrument Rank	87	42	30	23	88	41	30	23

***mean 1% significant level, **means 5% significant level and * means 10% significant level.

To validate the results, the last panel of Table 3.4 shows the results for the Sargan Tests of Over-riding identity and the Arellano and Bond Serial Correlation Tests in addition to the observations after first differencing. The Sargan test investigates the hypothesis that the instruments included correlate with the innovation term. The higher p-values of the Sargan test show that there is no issue of overriding identity and that the instruments are efficient because they do not correlate with the errors. In the same token, the high p-values of the AR (2) tests show that there are no serial correlations in the estimations. The diagnostic tests show that results and persistent issues of endogeneity do not affect the efficiency of the results.

Subsequently, the analyses were replicated using ATM coverage as a measure of financial innovation to determine its effect on bank stability. The results of that analysis are shown in Table 3.4. At the 5% significant level, we did not find any statistically meaningful evidence that ATM coverage induces bank stability for the various income clubs. However, we found a weak negative impact of ATM coverage on bank stability for the 107 countries. The outcome supports Johnson and Kwak's (2012) view that technological innovation in banks and other financial institutions facilitates bank service delivery but may not impact financial intermediation. The assertion by Johnson et al. (2012) and the result in this study is that technological innovations do not have direct impact on the soundness of the banking sector.

ATM coverage can improve financial inclusion and financial services delivery, but the result of the study implies that is weakly detrimental to the soundness of the financial system. The result confirmed that of Idun and Aboagye (2014) that reported that ATM coverage is injurious to economic growth of Ghana. The result is like Ansong et al. (2011) which found that ATM

coverage is harmful to financial savings in Ghana. Finally, in a more recent years, Idun (2021) did not find any meaningful relationship between ATM coverage and economic growth of 44 African countries.

3.6 Conclusions

Prior to the conduct of this paper, it did not appear in the extant literature that discrepancies in the national income level of countries could account for the degree with which financial innovation causes banking system soundness. The evidence predominantly held that banking system stability was influence bank's loan channel, banking system competition, the financial system stability, monetary policy, among hosts of other variables. This paper investigated the impact of income clubs of countries on the relationship between financial innovation and banking system stability using two proxies of financial innovation – growth in bank's credit to the private and ATM coverage across 107 countries.

The study found that globally, the growth in financial resources to finance the entrepreneurial activities of firms can lead to the banking system's stability. However, the evidence for the various income clubs is weak, hinting at a global advocate for continuous channelling funds to productive sectors to ensure sound financial systems. We did not find enough evidence that differences in per capita income account for how financial innovation affects bank stability. This shows that support for the private sector growth benefits bank stability everywhere. However, not all financial innovation has a direct beneficial effect on bank stability. The investment in ATM coverage does not directly impact bank stability. This can be attributed to ATMs being used for financial services delivery, which may not channel funds to productive areas. Excessive coverage of ATMs may also induce net withdrawals, which can boost excess

liquidity in the system and cause liquidity problems for the banks and hence bank instability. Future studies can look at which level of ATM coverage benefits bank stability among countries and income groupings.

CHAPTER FOUR

THE ROLE OF NATIONAL CULTURE IN FINANCIAL INNOVATION AND BANK STABILITY TRANSMISSION

4.1 Introduction

The banking system's stability is critical for economic development. Banking institutions develop screening technologies to identify innovative businesses that can help boost economic activity (Laeven, Levine & Michalopoulos, 2015). Additionally, financial systems facilitate the importation of technologies to stimulate the development of advanced innovations and accelerate the convergence of per capita income between developing and developed economies (Aghion & Howitt, 1992; King & Levine, 1993; Aghion, Howitt & Meyer-Foulkes, 2005; Laeven et al., 2015; Idun 2021). Stability in the banking system has a more significant impact on economic stability because it enables banks to invest effectively in productivity growth. On the other hand, the real sector's performance can also influence the banking sector's resilience. Banks can recoup all loan advances during expansionary periods because firms can sell their products and earn sufficient operating profits to repay their loans. The banking system can contribute to real sector instability (Acharya et al., 2014).

Financial system integration is accelerating as the World of finance becomes more globalised. Advanced countries' financial technologies quickly spread to emerging economies. Technological advancements in some economies are also facilitating financial inclusion. However, culture can accelerate or retard the spread of financial and technological innovation among technological imitators, thereby impacting global efforts to accelerate financial globalisation. Thus, the level of national culture can affect the interaction between the banking sector development and the stability of the real sector.

Culture shapes people's aspirations, ethical values, norms, and general life in a particular society. The people's culture can affect their decision-making. Nations are convergent in some ways, but certain cultural tenants reflect a community's peculiarities, alienating them from the rest of the World. The cultural dimension that embodies openness, liberty, confidence, and risk tolerance can accelerate innovations and influence the banking sector's credit allocation to productive sectors. Similarly, in predominantly collective, authoritative, and masculine societies, the acceptance of technological innovation that increases productivity can be determined by the society's most powerful and opinionated members.

This thesis aims to examine the role of national cultural dimensions in determining the effect of financial innovation on bank stability. The thesis augments recent research that examines culture as a factor in the development of the banking sector (Ashraf, Zheng, & Arshad 2016; Boubakri, Mirzaei & Samet, 2017; Mourouzidou-Damtsa, Milidonis & Stathopoulos, 2017; Cao, El Ghoul, Guedhami, & Kwok, 2019) and those that suggest that national culture induces innovation by firms (Boubakri et al., 2021). While the impact of national culture has been studied in leadership, management, and international trade, recent research has focused on how national culture influences banks' risk-taking orientation, performance, and choice of exchange rate regimes. This thesis examines how national culture can contribute to Schumpeterian creative destruction by emphasising how it can boost or dampen financial systems' credit growth, posing liquidity challenges for banks in their credit distribution, and thereby influencing the stability of banking systems. This chapter is the first examination of all six of Hofstede's national culture dimensions in the relationship between credit growth to support

innovation and bank stability. Given the countries with usable data on national cultural dimensions, we conducted investigations from 2005 to 2017 using 107 countries. Due to the dataset's non-parametric nature, we also used quantile regression analyses to examine the effect of national culture dimensions on banking systems' stability.

Additionally, our analyses are unique. The researcher decomposed national culture dimensions into higher and lower levels, allowing us to examine the national culture continuums that significantly impact the relationship between financial innovation and bank stability. Finally, we addressed the issue of reverse causality by utilising a dynamic instrumental variable estimation procedure that eliminates endogeneity and ensures that panel data estimates are persistent.

It was discovered that countries with above-average indulgence and uncertainty avoidance attenuate the impact of financial innovation on bank stability. Conversely, countries with a higher power distance and long-term orientation stimulate financial innovation into bank stability. In addition, it is reported that the six dimensions of national culture each have a non-linear but insightful impact on the various levels of bank stability.

The thesis makes several contributions to the empirical literature. First, the paper asserts that the contribution of financial intermediaries to high-quality innovations and financial stability cannot be assessed in isolation from a society's cultural orientation. The paper contributes to Schumpeterian perspectives by emphasising the critical role of cultural institutions in materialising "creative destruction" to stimulate sound financial intermediation. The argument

is that developing or adopting new financial processes to induce sound credit creation depends on the cultural orientation of societies. Because we used quantile regression, we were able to determine the effect of each cultural dimension on various levels of bank stability. The study's sample size (107 countries) is more significant than comparable studies. Finally, endogeneity was addressed by employing an instrumental variable dynamic GMM with a time-fixed effect. The next section discusses the relevant literature on the issues. The methods, results, discussion, conclusions, and recommendations are presented in the subsequent sections of this paper.

4.2 Literature Review

The debate over the impact of financial innovation on systemic risk appears unabated. Financial innovation, asset prices, collateralisation, bank diversification, information asymmetry, and profitability, contribute to banks' systemic risks (Kim, Batten, & Ryu, 2020; Arif, 2020; Islam, Olalere, Sobhani, & Shahriar, 2020; Pessarossi, Thevenon, & Weill, 2020). However, numerous channels exist to demonstrate the beneficial effect of financial innovation on sound financial intermediation to avert financial system instability. First, financial intermediaries employ stringent screening processes to weed out unscrupulous borrowers, ensuring that credit is directed toward productive sectors and thus toward productivity growth (Levine, 1997; Aghion, Howitt & Meyer-Foulkes, 2005; Laeven et al., 2015).

The Schumpeterian perspectives hold financial institutions can identify technological innovators with viable innovations and provide additional funding sources for entrepreneurs to actualise their innovations when financiers employ rigorous screening processes. Because technological innovators receive rents from their innovations because of intellectual property

protection (Acemoglu, Gancia, & Zilibotti, 2012), innovators would be able to meet their loan obligations timeously to avoid loan impairment and ensure sound banking systems. By enabling the advancement of credit to innovators and risk spreading, financial innovation can increase liquidity and stimulate economic activity (King & Levine, 1993). Additionally, financiers can promote technological advancement by developing new financial products that facilitate exchange and ensure an efficient payment system.

Financial innovation has some negative aspects that necessitate scrutiny of its interventions, particularly in the competitive banking sector, where it is inextricably linked to banks' risk-taking behaviour and performance (El Ghoul & Zheng, 2016; Ashraf, Zheng & Arshad, 2016; Ashraf & Arshad, 2017; Boubakri, Mirzaei & Samet, 2017; Gaganis, Hasan, & Pasiouras, 2020). Tufano (2003) asserts that financial innovation can be used to skirt regulations (thereby exposing banks to systemic shocks) and minimise tax payments (thereby putting a strain on sovereign revenue mobilisation).

Additionally, financial innovations can result in excessive liquidity, resulting in the development of high-risk financial products that disrupt economic activity (Merton, 1995; Pagano & Volpin, 2010; Kero, 2013). However, the impact of financial innovation on economic outcomes can be seen through the lens of the cultural institutions that define social norms, values, aspirations, what is desirable, and, more broadly, the behaviour and attitudes of society members. Thus, the influence of financial innovation on bank stability can be seen through the cultural lenses of society.

The influence of national culture on banking sector outcomes can be deduced from the suggestion that inclusive institutions promote financial development more than exclusive institutions. According to Acemoglu et al (2012), inclusive institutions promote the rule of law, effective governance, and property rights protection. Additionally, inclusive institutions encourage innovation and product variety by ensuring incumbents' intellectual property rights (Romer, 1990; Rosseau, 1998; Aghion & Howitt, 1992; Acemoglu et al., 2012).

The societal, cultural orientation is one aspect of institutional quality that can pervade economic activities. Hofstede's Cultural Dimension provides a comprehensive framework for explaining nations' cultural orientation and how culture can influence economic and social outcomes. National culture dimensions such as Individualism empowers political institutions to drive banks' risk-taking behaviour. In regimes characterised by inclusive institutions, we expect the banks to leverage the political environment to achieve intermediation goals. National culture can influence the channel through which banks induce systemic liquidity because culture guides the behaviour of financial market participants.

According to Hofstede, organisations or nations have six cultural dimensions. Power distance, individualism/collectivism, aversion to uncertainty, masculinity/femininity, long-term versus short-term orientation, and indulgence/restraint are examples of cultural dimensions (Minkov & Hofstede, 2014; Minkov & Hofstede, 2010). The term "power distance" explains how less powerful people accept and expect unequal power distribution among members of society. A higher power distance score indicates concentrated power. A lower score, on the other hand,

indicates that power is distributed in such a way that any member of society can challenge authority without fear or favour.

This cultural dimension is relevant to this study as it influences decisions on adopting banking system innovations. For example, suppose a subordinate expects a superior to determine which new banking products or services to patronise. This relationship between the superior and the follower will affect how the innovations are adopted instead of the subordinate exercising free will and adopting the innovations without the superior's consent. Financial innovation can have a greater positive impact in a society where adoption decisions are distributed evenly among members rather than centralized. A community with fewer distances between its power centres can also import technological innovation for development. All other factors being equal, bank and technological innovations that are attractive to authoritative members of society may have a higher degree of acceptability in promoting bank stability.

Individualism/collectivism constitutes the second classification of national culture. When members of a society work for their own or the interest of the group to which they belong, they are described as individualists. The lower the index, the higher the collective community level, with high group commitment, adherence to societal culture, and adherence to societal cohesion. Individualistic countries are typically developed. Incorporating national culture into the relationship between financial innovation and bank stability will help to clarify the critical role of developmental level and institutional quality in enhancing financial system soundness. Bank managers working in societies with a high level of individualism will increase the risk, even if they are foreign nationals, which means they do not have to share the same national culture

(Cao et al., 2019). Individualistic societies are more likely to accommodate banks' risk-taking behavior to ensure effective and sound financial intermediation (Mourouzidou-Damtsa, Milidonis, & Stathopoulos, 2017).

On the other hand, the cushion hypothesis suggests that high collective societies encourage individual risk-taking. The suggestion is that cooperative societies have systems to support members who fail in competitive engagements. The implication is that risk-taking and competitive behaviour in collective communities are likely to be high because of collective support channels. Avoidance of uncertainty is the third component of national culture. It addresses the issue of a society's level of tolerance for ambiguity. A community that has a higher tolerance for ambiguity is more likely to accept new developments and change the status quo. A society with a lower tolerance for ambiguity (a higher level of uncertainty avoidance) is more likely to avoid innovations. Uncertainty avoidance is critical in this study because bank innovations may harm financial intermediation, jeopardizing the banks' stability in societies that avoid innovation.

Masculinity/femininity is the fourth dimension of national culture. Masculinity refers to "a social preference for achievement, heroism, assertiveness, and material rewards for success," whereas femininity is defined as "a social preference for cooperation, modesty, caring for the weak, and a high quality of life. "Masculinity/femininity connote the roles of males/females in society. Whereas masculinity prioritises male values in the community, femininity prioritises female values. A low score on Hofstede's index indicates feminism, which suggests that a more significant segment of society is concerned with the welfare of others and the quality of life.

A more masculine culture scores higher, indicating a willingness to compete and a desire to be the best.

Long-term/short-term orientation is the fifth dimension of national culture, and it indicates the extent to which traditions are upheld and protected over future challenges. Low values on this index mean members of such a society adhere to rules and conventions and are unlikely to prioritize current and future challenges. Change is less likely to be accepted in such communities. Long-term societies, rather embrace change and prepare for the future. Normative and pragmatics are used to describe communities that are regarded as either short-term or long-term respectively. A low long-term orientation score indicates that such countries adhere to traditions, have less inclination saving for the future, and preference for speedy outcomes. This can have an impact on their openness to new ideas and the stability of banking systems.

Indulgence/restraint is the last cultural dimension. it addresses the extent to which members of a society are controlled. Lower scores indicate that people have control over their desires and impulses, whereas higher scores indicate a greater degree of indulgence or freedom to pursue one's path. Cynicism and pessimism are high in restrained communities, indicating very close socialisation in which people's actions and desires are controlled. A society with a higher level of indulgence can accept new ideas and innovations more readily than a society with a higher level of restraint.

In general, culture is the overall character– "the collective mental programming of people in an environment" (Attah-Boakye et al., 2020). National culture influences the degree to which firms can adopt innovative practices (Van Everdingen & Waarts, 2003), firm's entrepreneurial activities (Turro et al., 2014), firm's financial performance and management outcomes (Hooghiemstra et al., 2015). National culture also induces a firm's risk-taking behaviour (Li, Griffin, Yue, & Zhao, 2013), dividend policy (Shao, Kwok, Guedhami, 2010) and earnings quality (Kanagaretnam, Lim, & Lobo, 2011). National culture dimensions also influence a firm's innovation orientation (Chen, Podolski, Veeraraghavan, 2017, Boubakri et al., 2021). The authors found that firms in higher individualistic (uncertainty-avoidance) countries induce (reduce) higher patent impact and convert research and development expenditure into product innovations. Similar findings were reported in the study of Boubakri, Mirzaei, and Samet (2017) indicating that culture impacts on bank performance. Culture, as an informal institutional framework, can influence the actions of financiers and clients in order to influence information flow and induce bank stability.

Despite the emerging discourse on the role of national culture in financial intermediation and financial stability, the extant literature has not evaluated the role of culture in the Schumpeterian perspective where financiers are facilitators of technological innovation and stability of the financial systems. This paper addresses the role of the six national culture dimensions in the transmission of financial innovation into bank stability.

4.3 Methods

Secondary data on the variables were collected from the Global Financial Development Database (2020), World Development Indicator (WDI) (2020) and Hofstede's Insight Online Edition. The GFDD provided data on bank concentration (BC) and the Z-score (BS). The WDI provide data on control variables, namely GDP per capita (GD), inflation (INF), trade openness (TRADE) and cellular mobile coverage (MOB). Data on the national culture dimensions were obtained from Hofstede's National Culture database. The period for the study is 2005-2017.

The number of countries included is 107 making the expected number of observations for the panel data structure 1391. However, there are unavailable observations in the dataset, so we worked with unbalanced data. There is a reason to believe that the unbalanced nature of our dataset would not affect the efficiency of our estimates because the generalised methods of moment (GMM) technique take care of such irregularities by using the first differences of the variables in its estimation. Notwithstanding, the first differencing associated with the GMM technique led to the loss of a degree of freedom. The empirical section shows that the degree of freedom becomes less than 1000 for all our GMM estimations due to the use of first differencing in the estimations.

4.3.1 Model Specification

The paper used the dynamic Generalised Method of Moments (GMM) estimation techniques to meet the objectives of the role of the national culture dimensions in the effect of financial innovation on bank stability. The GMM procedure has the advantages of reducing endogeneity, heteroskedasticity, and serial correlation. The GMM model requires the use of instruments that are correlated with the explanatory variables but at the same time uncorrelated with the error term. We used the first lags of the explanatory variables as transformed instruments. For the

untransformed instruments, the six national culture dimensions were used. To address the issue of endogeneity, the Sargan test of overriding identity was undertaken. The null hypothesis of the Sargan test states that the instrument used is endogenous, meaning they corrected with the explanatory variables and uncorrected with the error term.

Similarly, to address the issue of serial correction, the Arellano-Bond AR (2) test was used to investigate the presence or absence of serial correlation. For this test, a higher p-value (P-value greater than 0.05) indicates the absence of serial correlation. The GMM method treated the lags of the dependent variable (bank stability) as endogenous, and the model is stated as follows:

$$BS_{it} = \alpha_0 + BS_{it-1} + \sum_{c=1}^{n} \beta_c Control\ Var_{it} + \sum_{f=1}^{n} \beta_f FIN_{it} + \sum_{fi=1}^{n} \beta_{fi} FIN * NCD + \sum_{i=1}^{n} \beta_i NCD_{it} + v_t + u_{it} \quad (4.1)$$

where BS is bank stability measured by the z-score; Control var is the set of control variables, namely, GDP per capita (GDP), inflation (INF), technological infrastructure coverage (MOB), Trade openness (TRADE) and bank concentration (BC). FIN is financial innovation. NCD is the national culture dimensions, v_t is the period effects; and u_{it} is the error term.

GDP per capita was included because a nation's income determines economic activity and can influence firms' decisions to innovate, sell their products, and use a portion of the proceeds to repay loan obligations. Inflation can affect the cost of borrowing, reducing firms' willingness

to seek additional funding from banks. Cellular penetration measures the technological infrastructure and spread of internet banking, SMS banking, mobile money banking, and bank transfers, among other services. Trade openness is a proxy for the degree to which globalisation has resulted in the spillover effect of shocks from interdependent economies, resulting in financial instability. Finally, the level of bank concentration influences the banks' competitive behaviour, which affects their risk-taking behaviour.

The GMM procedure is suitable for the study because our dataset contains smaller time-series dimensions than cross-sections. The study also used quantile regression to analyse the effect of each of the national culture dimensions of bank stability. The method would enable the researcher to examine the asymmetric relationship between the cultural dimensions and bank stability.

Introduced by Koenker and Bassett (1978), quantile regression estimates the linear relationship between the regressors and a specified quantile of the dependent variable. One significant application of quantile regression is the least absolute deviations (LAD) estimator, which fits the response variable's conditional median.

Quantile regression provides a more detailed description of the conditional distribution than conditional mean analysis alone, allowing us to describe how regressor variables affect the median or, in some cases, the 10th or 95th percentile of the response variable. Furthermore, because quantile regression does not require any strong distributional assumptions, it is a reliable method for modeling these relationships.

The following is a brief background of the quantile regression methods as provided by Koenker (2005). Assume that there is a random variable Y, the probability function of Y is given by:

$$F(y) = Prob(Y \leq y) \qquad (4.2)$$

So that for $0 < \vartheta < 1$, the $\vartheta - th$ quantile of Y be defined as the smallest y satisfying $F(y) \geq \vartheta$:

$Q(\vartheta) = \inf(y: F(y) \geq \vartheta$:

Assuming as set of n observations on Y, the empirical distribution function is given by:

$$F(y) = \sum_{k} 1\,(Y_i \leq y) \qquad (4.3)$$

Where $1(z)$ is an indicator function that takes the value 1 if the argument z is true or o otherwise. The resulting empirical quantile is given by:

$$Q_n(\vartheta) = inf(y: Y_n(y) \geq \vartheta) \qquad (4.4)$$

Alternatively, in the form of a simple optimization problem:

$$Q_n(\vartheta) = argmin\xi \left\{ \sum_{i:Y,\geq\xi} \vartheta|Y_i - \xi| + \sum_{i:Y,\geq\xi} 1 - \vartheta|Y_i - \xi| \right\}$$

$$= argmin_{\xi} \left\{ \sum_{i} \rho_{\vartheta}\,(Y_{\xi} - \xi) \right\} \quad (4.5)$$

Where $\rho_{\vartheta}(u) = u(\vartheta - 1(u < 0))$ is the check function which weights positive and negative values asymmetrically.

Quantile regression permits regressors X in addition to the estimation above on the dependent variable. By considering a linear specification for the conditional quantile of the response variable Y given values for the p-vector of the regressors X, we have:

$$Q\left(\vartheta\middle|X_{\rho}\beta(\vartheta)\right) = X_i'\beta(\vartheta) \qquad (4.6)$$

Where $\beta(\vartheta)$ is the vector of the coefficients associated with the $\vartheta - th$ quantile.

The conditional alternative is the regression estimator:

$$\widehat{\beta_n}(\vartheta) = argmin_{\beta(\vartheta)}\left\{\sum_i \rho_{\vartheta}\left(Y_i - X_i'\beta(\vartheta)\right)\right\} \qquad (4.7)$$

4.3.2 Measurement of Financial Innovation

Financial innovation is classified by the Bank for International Settlements as price-risk-transferring innovations, credit-risk-transferring instruments, liquidity-generating innovations, credit-generating instruments, and equity-generating instruments. Price-risk-transfer innovations reduce the volatility of exchange rates and inflation rates for investors and consumers. Banks and other financial institutions use credit risk-transferring instruments to transfer their default risks. Furthermore, liquidity-generating innovations include those that increase financial market liquidity, allow surplus units to access new sources of funds, and allow stakeholders to avoid capital constraints imposed by regulations. Similarly, credit-generating innovations are intended to increase borrowing by providing borrowers with greater credit allocation depth. Finally, equity-generating instruments are introduced to strengthen financial institutions' capital bases (Abor, 2018). Product, process, and financial system/institutional innovations are the three types of financial innovations (Tufano, 2003).

Cashless accounts, home-savers accounts, offshore banking, premier banking, mobile money, and special deposits are examples of product innovations. Process innovations are intended to improve the delivery of financial services. Examples include ATMs, electronic cards,

telephone banking, SMS banking, internet banking, and so on. The proliferation of ICT infrastructure nowadays fuels process innovations (Idun, 2021).

The swiftness with which a country adopts credit information sharing systems has been used as a measure of financial innovation by Laeven, Levine, and Michalopoulos (2015), as well as Idun and Aboagye (2014) and Idun (2021). Finally, institutional innovations are changes in the financial system or the establishment of a new financial institution because of regulation. Laeven et al. (2015), Idun et al. (2014), and Idun (2021) used credit disbursement growth as a measure of financial system innovation.

The researcher used the increase in bank credit to the private sector, as described by Leaven et al. (2015), Idun et al. (2014), and Idun (2021), to capture innovations in banking systems intermediation that enhances credit generation and boosts liquidity. Other studies have used patents' impact and research and development expenditure, and these measures relate to attempts by firms to innovate and development of new products, respectively. However, expenditure on R&D and processes leading to the acquisition of patent rights can be financed with the growth in credit to the private sector. This assertion is in line with the Schumpeterian growth theory, which suggests that new sources of finance are used to finance innovations by firms (Aghion & Howitt, 1992, Aghion et al., 2005, Laeven et al., 2015). Our measurement of financial innovation assumes that firms will use bank loans to finance their innovations, even though other studies suggest that innovative firms prefer to use equity to finance corporate innovations (Boubakri et al., 2021).

There are compelling reasons firms would want to use additional credit facilities to finance innovation activities instead of equity. To begin with, not all firms have the capacity to raise additional funds through initial public offerings (IPOs), barring the excessive costs associated with IPOs. Bank credits can enhance financial leverage, increasing their performance because managers would have to cover at least the finance cost within the accounting period. Bank credit leads to an interest tax shield because of the interest payment, which can increase return on equity and enhance shareholders' value (owners). Firms with an optimal debt in their financing structure can increase tax benefits to the tune of 5.2% of firm value (Graham, 2002; Ko & Yoon, 2011).

Martin (2003) also showed with Canadian data that more debt financing could decrease the commitment level of firm-specific capital and make entry into an industry profitable. The implication is that more debt financing can help managers increase shareholders' wealth even though more debt financing can also increase the incentive for shareholders to assume more risk. Finally, the acquisition of bank loans can send signals to the financial market that the firm is well-managed, and therefore, financiers are willing to extend more credits to the firm's manager.

4.3.3 Measurement of Bank Stability

A bank's ability to tolerate shocks due to its strong liquidity or capitalisation position defines bank stability. Value-at-risk and expected shortfalls are used in determining a bank's risk of insolvency. The capital assets pricing model (CAPM) can also be used to determine the chances of individual banks. These measures are recommended by Basel II and Basel III, but because they are market-based measures, they are inapplicable to unlisted banks.

To maintain consistency in measurement, the study used the parsimonious z-score, which is estimated using regulated accounting data, as a proxy for bank stability. The average z-score is calculated as

$$Z - score = \frac{ROA + \left(\frac{Equity\ capital}{Total\ assets}\right)}{SD(ROA)} \qquad (4.8)$$

where ROA is a bank's return on assets; and SD(ROA) is the standard deviation of ROA.

The numerator represents the bank's buffer to withstand unfavorable conditions such as a bank run or insufficient deposits, while the denominator reflects the variability of the bank's earnings. The higher the numerator, the better positioned a bank is to continue operating in the aftermath of a crisis. Given the volatility of its earnings, a larger equity-capital-based bank is regarded as more stable. A higher z-score indicates a lower risk of a bank, and vice versa.

In the other empirical studies, various variations of the z-score were used. Some studies used the overall sample standard deviation as the denominator and the ROA and equity-assets ratio as the numerator (Laeven & Levine, 2009; Cihak, 2007; Beck & Laeven, 2006). Other authors estimated the z-score using mean ROA figures, equity-to-total assets, and the standard deviation of ROA (Bertay, Demirguc-Kunt & Huizinga, 2013). However, the denominator in the equation of their z-score measure is time-invariant, which may not capture the risk profile of banks over time. To estimate the z-score, use higher frequencies of the variables in equation (1).

Table 4.1: Definition and Roles of the Variables

Variable	Measurement	Role	Source
Bank stability (BS)	Bank z-score	It quantifies the probability of a country's commercial banking sector defaulting. The Z-score evaluates a country's commercial banking system's buffer (capitalisation and returns) against the volatility of those returns.	Global Financial Development Database (2021)
Bank Concentration (BC)	Assets of the three largest commercial banks as a share of total commercial banking assets. Total assets include total earning assets, cash and due from banks, foreclosed real estate, fixed assets, goodwill, other intangibles, current tax assets, deferred tax assets, discontinued operations, and other assets.	It captures the structure and the competitive behaviour of the banks in banking systems.	Global Financial Development Database (2021)
Financial innovation (FIN)	Growth in Private credit by deposit money banks and other financial institutions to GDP.	Measures the banking systems' ability to spot and provide more credits to entrepreneurs with viable projects.	Estimated from data from the Global Financial Development Database
Mobile Cellular Subscription (MOB)	Subscriptions to mobile cellular telephone services are subscriptions to a public mobile	It captures a country's telecommunication infrastructure, which can aid in the	World Development Indicators (WDI, 2020)

	telephone service that provides access to the public switched telephone network via cellular technology. The indicator encompasses (and is subdivided into) the number of post-paid subscriptions and active prepaid accounts (i.e., used during the last three months). The indicator applies to all subscriptions to mobile cellular services that include voice communications. Subscriptions via data cards or USB modems are not included, nor are subscriptions to public mobile data services, private trunked mobile radio, telepoint, radio paging, or telemetry services.	delivery of financial services	
Inflation (INF)	Change in the consumer price index with 2010 as the base year	It captures the level of price stability in a country.	WDI (2020)
Trade	The sum of exports and imports as a ratio of GDP	It captures the level of trade openness in a country	WDI (2020)

Source: Author's construct (2022)

4.4 Findings and Discussions

4.4.1 Descriptive Statistics

The six national culture dimensions were transformed into 12 dummy variables, each for higher and lower dimensions. For example, the dummy for above-average power distance (PD) takes 1 if a country has a power index average above our sample mean of power distance (66.93) and 0 if a country's score is below this average. The dummy creation procedure was repeated for all the other 11 categorisations. It, therefore, resulted in 12 above – and below averages for the six dimensions.

Table 4.2 shows the distribution from the categorisation of the cultural dimensions. We see that 59% of our sample countries have above-average power distance whilst 41% have a below-average level of power distance. The distribution of power distance indicates that the nations are mostly authoritarian communities where members look up to people of authority when making decisions. The economic implication of the dominant power distant society is that people with higher authority would influence decisions concerning entrepreneurial activities and bank risk-taking usually under planned and orderly way.

Also, the mean score for Individualism is 37.54 which means about 38% of the countries have their level of Individualism above the average score, and 62% have scores below the mean average which shows that majority of the countries are collective communities that strive for the betterment of society more than individual goals. In a collective society, we expect the risk-taking behaviour of bank managers to be subdued by the altruistic goals of the greater members of the society.

The average score for masculinity is 46.95, which indicates the communities are tilting towards feminists' societies which emphasises the embracement of the minority views. 48% of the nations have above average level of masculinity whilst 52% have an above level of masculinity. Female bank officials are more likely to promote orderliness and maintain the status quo which implies that there would be less risk-taking and therefore greater stability of their banks.

Similarly, the average level of uncertainty avoidance is 66.49, which is high. Of this, 52% of the sample have above-average uncertainty avoidance scores, leaving only 48% with below-average uncertainty avoidance scores. This means that the communities are not receptive to new ideas and ways of doing things. Such communities are inclined not to accept financial innovation easily unless members are convinced of greater benefits entrepreneurial activities. However, since empirical research does not exist, the current study sought to examine how uncertainty avoidance influences the relationship between financial innovation and bank stability.

In addition, the average level of long-term orientation is 43.35 in a continuum of 0 to 100. This means the societies are essentially short-term oriented. The implication is that our sample countries mostly prefer innovations that can solve their immediate financial problems. Among the countries, 46% scored above average long-term orientation, and 54% achieved a below-average level of long-term orientation.

Finally, the level of indulgence for the observation is 46.46. 45% of the communities had an above-average index of indulgence, whilst 55% had below-average scores of indulgences. This shows that our sample countries are less receptive to openness. We expect low indulgence countries to have other means of ensuring that bank stability is maintained other than relying on financial innovation to promote bank stability.

Table 4.2 also shows that national culture dimensions differ across per capita income clubs. Power distance is highest in lower-middle-income countries and lowest in high-income countries (53.33). Conversely, Individualism, long-term orientations and indulgence are highest in high-income countries than the other income groups. Similarly, uncertainty avoidance is higher in upper-middle-income countries (71.50) and high-income countries (66.79) than lower-middle-income countries (63.50) and low-income countries (52.33). Masculinity tends to be higher in upper-middle-income countries. Lower-middle income countries recorded the lowest level of masculinity. Bank managers operating in lower-middle income and upper middle income are more likely to reduce excessive risk-taking in financial intermediation than their colleagues in high-income countries.

Table 4.2: Facts on the Hofstede's National Culture Dimensions

Dimension	**Average Score**
Power Distance	**66.93**
Above-average Power Distance (PDH)	0.59

Below Average Power Distance (PDL)	0.39
Individualism (IND)	**37.54**
Above Average Individualism (INDH)	0.38
Below Average Individualism (INDL)	0.62
Masculinity (MAS)	**46.95**
Above-average masculinity (MASH)	0.48
Below average masculinity (MASL)	0.52
Uncertainty Avoidance	**66.49**
Below Average uncertainty (UAH)	0.52
Below average uncertainty (UAL)	0.48
Long-term orientation (LTO)	**43.35**
Above-average long-term orientation (LTOH)	0.46
Below average long-term orientation (LTOL)	0.54

Indulgence (IDUL)	**46.46**
Above-average indulgence (IDULH)	0.45
Below average indulgence (IDULL)	0.55

	PD	IND	MAS	UA	LTO	IDUL
High Income Countries	53.33	53.09	46.47	66.79	50.62	50.66
Upper Middle-Income Countries	75.71	27.76	51.26	71.5	43.7	42.79
Lower Middle-Income Countries	77.04	27.67	41.21	63.5	33.26	40.71
Low Income Countries	74.17	22.5	47.5	52.33	22.67	48
All Countries	66.93	37.63	46.87	66.74	43.79	46

Notes: PD=power distance; IND=Individualism; MAS=Masculinity; UA=Uncertainty Avoidance; LTO=Long-term Orientation and IDUL=Indulgence. The suffix H and L associated with these variables mean higher – and lower levels of the variables, respectively.

The distribution of cultural dimensions across the countries in our sample is shown in Table 4.2. Malaysia (100) and Slovakia have the greatest power distance, while Guatemala, Panama, and Saudi Arabia have 95. Austria had the smallest power distance (11). Surprisingly, countries with solid religious inclinations, such as Israel, also had low levels of power distance, in contrast to Malaysia and Saudi Arabia. Australia ranked highest in terms of Individualism (90), while Guatemala ranked lowest in terms of Individualism (70). Generally, countries with a high degree of power distance also demonstrated a low degree of Individualism and vice versa.

On the other hand, Japan, Argentina, and the Czech Republic have a moderate power distance and individualism.

Similarly, Slovakia has a certainty level of masculinity (100), which creates a community for the strong when combined with a certainty level of power distance. Scandinavian countries such as Norway, Latvia, and Denmark have low masculinity rates, indicating that their communities support the weak. Greece has the highest uncertainty avoidance index at 100, while Singapore has the lowest index at 8. Ghana's long-term orientation is the lowest among the 107 nations, even though the country has a solid index for power distance and indulgence. Conversely, Taiwan has the most potent form of long-term orientation. Venezuela, Mexico, Puerto Rico, El Salvador, and Columbia have high indulgence. It shows that the South American countries inculcate a risk-loving attitude among their societal members, which indicates that they tend to be receptive to innovations. In the same token, Egypt, Latvia, Albania, and Belarus are among the countries with the weakest level of indulgence. The divergence among cultural dimensions among the countries indicates the different levels of financial innovation and bank stability.

Table 4.3 illustrates the average values of financial innovation and bank stability. Bank stability for the whole sample averages 14.40. Countries such as Jordan, Panama, Libya, Morocco, Luxembourg, and Tunisia have very high above-average levels of bank stability. However, these countries have below-average level of financial innovation (0.024), signifying that financial innovation may not directly impact bank stability. In the same token, countries with below-average levels of bank stability mostly have above-level growth in credits.

Table 4.3: Distribution of National Culture Dimensions for the Sampled Countries

Country	PD	IND	MAS	UA	LTO	IDUL	Country	PD	IND	MAS	UA	LTO	IDUL	Country	PD	IND	MAS	UA	LTO	IDUL
Albania	90	20	80	70	61	15	Ghana	80	15	40	65	4	72	Nigeria	80	30	60	55	13	84
Algeria	80	35	35	70	26	32	Greece	60	35	57	100	45	50	North Macedonia	90	22	45	87	62	35
Angola	83	18	20	60	15	83	Guatemala	95	6	37	98	_	_	Norway	31	69	8	50	35	55
Argentina	49	46	56	86	20	62	Honduras	80	20	50	50	_	_	Pakistan	55	14	50	70	50	0
Armenia	85	22	50	88	61	25	Hong Kong	68	25	57	29	61	17	Panama	95	11	44	86	_	_
Australia	38	90	61	51	21	71	Hungary	46	80	88	82	58	31	Paraguay	70	12	40	85	20	56
Austria	11	55	79	70	60	63	Iceland	30	60	10	50	28	67	Peru	64	16	42	87	25	46
Azerbaijan	85	22	50	88	61	22	India	77	48	56	40	51	26	Philippines	94	32	64	44	27	42
Belarus	95	25	20	95	81	15	Indonesia	78	14	46	48	62	38	Poland	68	60	64	93	38	29
Belgium	65	75	54	94	82	57	Iran	58	41	43	59	14	40	Portugal	63	27	31	99	28	33
Bhutan	94	52	32	28	_	_	Iraq	95	30	70	85	25	17	Puerto Rico	68	27	56	38	0	90
Bolivia	78	10	42	87	25	46	Ireland	28	70	68	35	24	65	Qatar	93	25	55	80	_	_
Bosnia and Herzegovina	90	22	48	87	70	44	Israel	13	54	47	81	38	_	Romania	90	30	42	90	52	20
Brazil	69	38	49	76	44	59	Italy	50	76	70	75	61	30	Russia	93	39	36	95	81	20
Bulgaria	70	30	40	85	69	16	Jamaica	45	39	68	13	_	_	Sao Tome` and Principe	75	37	24	70	32	41

Burkina Faso	70	15	50	55	27	18
Canada	39	80	52	48	36	68
Chile	63	23	28	86	31	68
China	80	20	66	30	87	24
Colombia	67	13	64	80	13	83
Croatia	73	33	40	80	58	33
Czech Republic	57	58	57	74	70	29
Denmark	18	74	16	23	35	70
Dominican Republic	65	30	65	45	13	54
Ecuador	78	8	63	67	_	_
Egypt	70	25	45	80	7	4
El Salvador	66	19	40	94	20	89
Estonia	40	60	30	60	82	16
Ethiopia	70	20	65	55	_	46
Fiji	78	14	46	48	_	_
Finland	33	63	26	59	38	57
France	68	71	43	86	63	48
Georgia	65	41	55	85	38	32
Germany	35	67	66	65	83	40
Japan	54	46	95	92	88	42
Jordan	70	30	45	65	16	43
Kazakhstan	88	20	50	88	85	22
Kenya	70	25	60	50	_	_
Kuwait	90	25	40	80	_	_
Latvia	44	70	9	63	69	13
Lebanon	75	40	65	50	14	25
Libya	80	38	52	68	23	34
Lithuania	42	60	19	65	82	16
Luxembourg	40	60	50	70	64	56
Malawi	70	30	40	50	_	_
Malaysia	100	26	50	36	41	57
Malta	56	59	47	96	47	66
Mexico	81	30	69	82	24	97
Moldova	90	27	39	95	71	19
Morocco	70	46	53	68	14	25
Mozambique	85	15	38	44	11	80
Namibia	65	30	40	45	35	_
Netherlands	38	80	14	53	67	68
Saudi Arabia	95	25	60	80	36	52
Senegal	70	25	45	55	25	_
Serbia	86	25	43	92	52	28
Sierra Leone	70	20	40	50	_	_
Singapore	74	20	48	8	72	46
Slovakia	100	52	100	51	77	28
Slovenia	71	27	19	88	49	48
South Africa	49	65	63	49	34	63
Spain	57	51	42	86	48	44
Sri Lanka	80	35	10	45	45	_
Suriname	85	47	37	92	_	_
Sweden	31	71	5	29	53	78
Switzerland	34	68	70	58	74	66
Syria	80	35	52	60	30	_
Taiwan	58	17	45	69	93	49
Tanzania	70	25	40	50	34	38
Thailand	64	20	34	64	32	45
Trinidad and Tobago	47	16	58	55	13	80
Tunisia	70	40	40	75	_	_

New Zealand	22	79	58	49	33	75
Turkey	66	37	45	85	46	49
Ukraine	92	25	27	95	86	14
United Arab Emirates	90	25	50	80	_	_
United Kingdom	35	89	66	35	51	69
United States	40	91	62	46	26	68
Uruguay	61	36	38	98	26	53
Venezuela	81	12	73	76	16	100
Vietnam	70	20	40	30	57	35
Zambia	60	35	40	50	30	42

Source: Hofstede's National Culture Insight (2020)

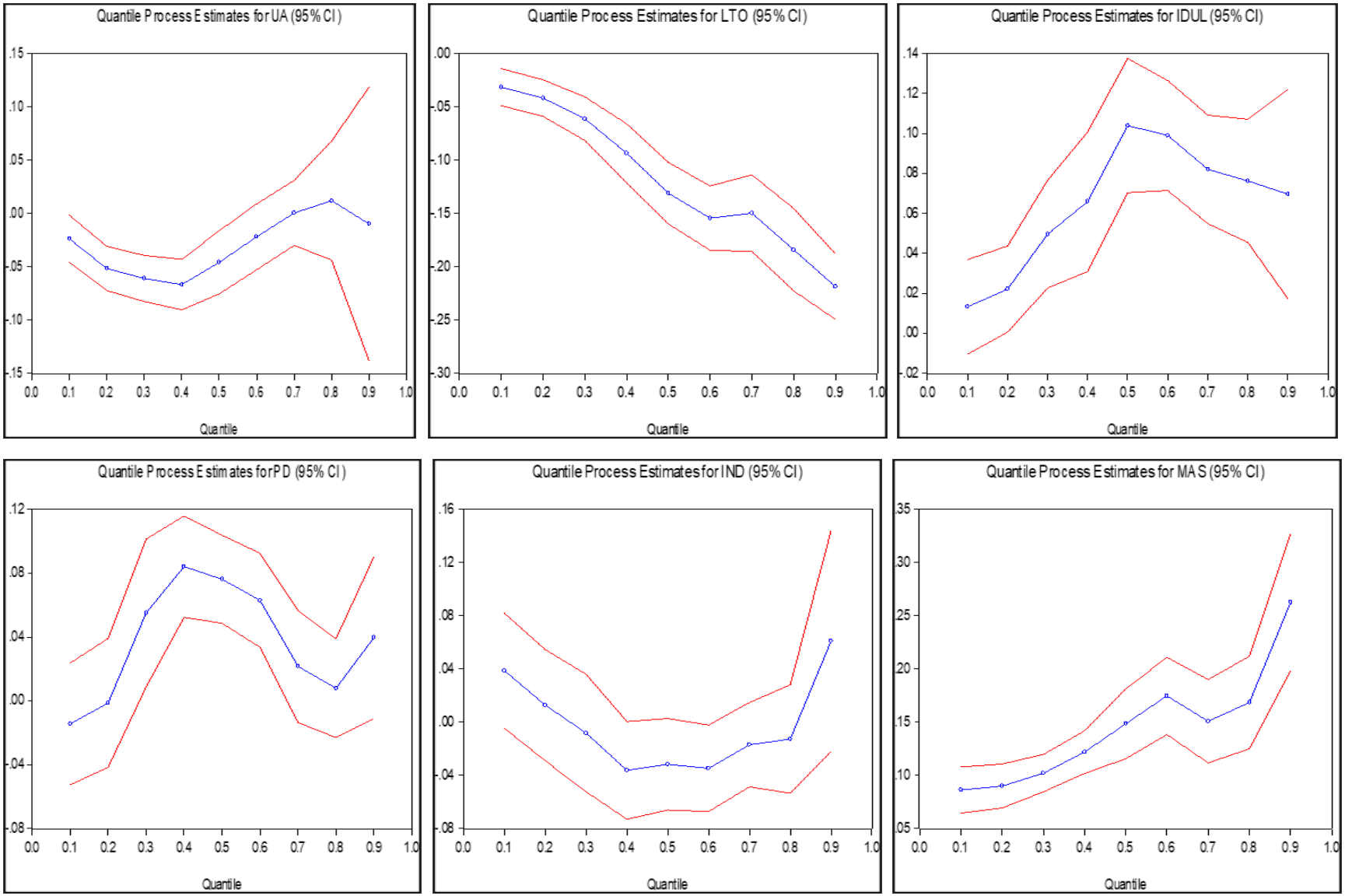
Table 4.4: Averages of Z-scores and Financial Innovation (Growth in Credit) for the Sampled Countries 2005-2017

Country Name	z-score	Fin. innovation	Country Name	z-score	Fin. innovation	Country Name	z-score	Fin. innovation
Albania	14.87	0.06	India	16.51	0.02	São Tomé and Principe	3.76	0.01
Algeria	16.26	0.06	Indonesia	5.04	0.02	Saudi Arabia	17.84	0.03
Angola	11.07	0.10	Iran, Islamic Rep.	6.31	0.05	Senegal	14.54	0.05
Argentina	6.36	0.03	Iraq	22.65	0.14	Serbia	14.56	0.03
Armenia	11.44	0.15	Ireland	5.94	-0.08	Sierra Leone	4.67	0.03
Australia	15.40	0.02	Israel	28.19	-0.01	Singapore	23.91	0.02
Austria	24.01	-0.01	Italy	13.31	0.01	Slovak Republic	16.36	0.04
Azerbaijan	7.66	0.06	Jamaica	8.10	0.04	Slovenia	2.90	-0.01
Belarus	3.56	0.03	Japan	14.69	0.01	South Africa	13.74	0.00
Belgium	12.46	0.00	Jordan	54.48	-0.01	Spain	18.74	-0.02
Bhutan	21.26	0.08	Kazakhstan	4.16	-0.02	Sri Lanka	12.02	0.03
Bolivia	12.28	0.03	Kenya	17.80	0.01	Suriname	10.54	0.04

Bosnia and Herzegovina	15.53	0.02	Kuwait	16.17	0.05	Sweden	11.63	0.02
Brazil	15.55	0.05	Latvia	5.86	-0.06	Switzerland	12.24	0.01
Bulgaria	7.90	0.02	Libya	39.29	0.09	Syrian Arab Republic	5.95	0.00
Burkina Faso	7.36	0.06	Lithuania	5.94	-0.03	Tanzania	11.03	0.04
Canada	15.70	0.00	Luxembourg	33.47	0.03	Thailand	6.36	0.01
Chile	7.06	0.01	Malawi	14.79	0.07	Trinidad and Tobago	26.63	0.01
China	19.35	0.03	Malaysia	15.88	0.01	Tunisia	32.81	0.02
Colombia	5.90	0.06	Malta	26.72	-0.02	Turkey	8.82	0.09
Croatia	4.90	0.01	Mexico	21.80	0.05	Ukraine	4.39	0.00
Denmark	16.55	0.00	Moldova	6.76	-0.01	United Arab Emirates	25.61	0.04
Dominican Republic	26.06	0.02	Morocco	39.14	0.03	United Kingdom	7.86	-0.01
Ecuador	5.00	0.03	Mozambique	4.08	0.08	United States	28.31	0.00
Egypt, Arab Rep.	17.42	-0.04	Namibia	9.17	0.00	Uruguay	5.88	0.01

El Salvador	25.67	0.00	Netherlands	8.97	0.00	Venezuela, RB	8.13	0.06
Estonia	6.17	0.01	New Zealand	20.89	0.01	Vietnam	13.88	0.06
Ethiopia	9.84	0.00	Nigeria	16.58	0.03	Zambia	8.76	0.04
Fiji	12.43	0.02	North Macedonia	4.92	0.06			
Finland	12.13	0.02	Norway	8.14	0.02			
France	17.37	0.02	Pakistan	10.87	-0.03			
Georgia	5.83	0.10	Panama	40.46	0.00			
Germany	18.20	-0.02	Paraguay	15.80	0.09			
Ghana	7.69	-0.01	Peru	16.19	0.06			
Greece	4.69	0.02	Philippines	17.83	0.04			
Guatemala	18.18	0.03	Poland	8.53	0.05			
Honduras	28.32	0.03	Portugal	10.57	-0.02			
Hong Kong SAR, China	13.42	0.03	Qatar	26.63	0.06			
Iceland	1.71	-0.08	Romania	5.95	0.02			
			Russian Federation	7.19	0.05			

Source: Estimated from the Global Financial Development Database (2020) and World Development Indicators (2020)



Note: the red graphs are the upper – and lower bounds that show the level of significant at 5% and the blue graphs are estimates of the relationships

Figure 4.1: Quantile Regression Estimates of the Relationship between National Culture Dimensions and Bank Stability

Source: Author

Table 4.5: The role of national culture dimensions in the relationship between financial innovation and bank stability

Eq Name:	EQ01	EQ02	EQ03	EQ04	EQ05	EQ06
Method:	GMM	GMM	GMM	GMM	GMM	GMM
Dep. Var:	BS	BS	BS	BS	BS	BS
BS(-1)	0.4170**	0.3857**	0.3929**	0.3855**	0.3685**	0.4191**
	(0.0109)	(0.0147)	(0.0150)	(0.0126)	(0.0164)	(0.0157)
GDP	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
INF	0.0198*	0.0327**	0.0337**	0.0305**	0.0240**	0.0095
	(0.0094)	(0.0104)	(0.0114)	(0.0096)	(0.0075)	(0.0068)
MOB	0.0017	-0.0037	-0.0065	-0.0019	0.0086	-0.0021
	(0.0045)	(0.0036)	(0.0043)	(0.0036)	(0.0058)	(0.0054)
TRADE	0.0150*	0.0184**	0.0075	0.0165**		0.0113
	(0.0066)	(0.0050)	(0.0066)	(0.0046)		(0.0062)
BC	-0.0435**	-0.0649**	-0.0701**	-0.0640**	-0.0684**	-0.0406**
	(0.0051)	(0.0043)	(0.0055)	(0.0042)	(0.0081)	(0.0052)
FIN	5.7048**	2.4939**	3.2113**	2.3387**	-12.9315**	-6.5457**
	(0.2577)	(0.7360)	(0.2943)	(0.7399)	(0.9246)	(0.7371)
FIN*IDULH	-12.7549**					
	(1.0056)					
FIN*INDH		0.4602				
		(0.7944)				

FIN*LTOH			-3.2241**			
			(0.9041)			
FIN*MASH				0.1846		
				(0.7719)		
FIN*PDH					17.6391**	
					(0.9918)	
FIN*UAH						12.6089**
						(0.9415)
2007	-0.4021**	-0.4506**	-0.3696**	-0.4551**	-0.6557**	-0.4899**
	(0.0760)	(0.0784)	(0.0902)	(0.0675)	(0.0906)	(0.0870)
2008	-1.2135**	-1.1193**	-1.4604**	-1.1161**	-1.1327**	-0.9381**
	(0.0983)	(0.0974)	(0.1381)	(0.0896)	(0.1234)	(0.1149)
2009	1.6523**	1.6700**	-0.0054	1.5898**	0.9351**	1.5394**
	(0.1243)	(0.1680)	(0.1829)	(0.1627)	(0.1419)	(0.1713)
2010	-0.1307	0.1255	0.1521	0.1191	0.1113	-0.1029
	(0.0956)	(0.0759)	(0.1972)	(0.0748)	(0.1043)	(0.1219)
2011	-0.2691**	-0.2842**	-0.1040	-0.2790**	-0.2512**	-0.1851*
	(0.0684)	(0.0622)	(0.1930)	(0.0582)	(0.0807)	(0.0769)
2012	0.3828**	0.2870**	0.1535	0.2606**	0.3304**	0.4509**
	(0.0613)	(0.0592)	(0.1984)	(0.0560)	(0.0542)	(0.0585)
2013	-0.0136	0.0536	0.2525	0.0780	-0.0210	0.0439

	(0.0847)	(0.0725)	(0.2141)	(0.0653)	(0.0835)	(0.0782)
2014	-0.1684**	-0.112*	0.1069	-0.1242**	-0.1577**	-0.1269*
	(0.0572)	(0.0474)	(0.2124)	(0.0388)	(0.0566)	(0.0537)
2015	0.7208**	0.7028**	0.7657**	0.712**	0.7454**	0.6830
	(0.0619)	(0.0499)	(0.2302)	(0.0483)	(0.0678)	(0.0499)
2016	0.1524*	0.1978**	0.9867**	0.2110**	0.2680**	0.2559**
	(0.0658)	(0.0520)	(0.2402)	(0.0555)	(0.0540)	(0.0748)
2017	-0.1492*	0.0443	1.0528**	0.0261	-0.0784	-0.1185
	(0.0667)	(0.0800)	(0.2424)	(0.0732)	(0.0736)	(0.0758)
Observations:	877	877	877	877	877	877
Sargan Test	0.2266	0.1974	0.2463	0.1827	0.3244	0.2741
AR(2)	0.0406	0.998	0.6215	0.997	0.9354	0.6895
Instruments	81	81	81	81	81	81

4.4.2 Empirical Results

Figure 4.1 depicts the graphical results from the quantile regression for the relationship between the national culture dimensions and bank stability. It shows that uncertainty avoidance generally positively influences bank stability even though getting to the 90^{th} quantiles. The relationship appears to dip downward, indicating that at the highest level of bank stability, as did in indulgence, can be detrimental to global banking stability. This relationship between uncertainty avoidance and bank stability is also reflected at the lower level of bank stability. From the 10^{th} to 40^{th} quantiles (lower level of bank stability), we see that an increase in uncertainty avoidance leads to a drop in bank stability. The relationship between uncertainty avoidance and bank stability implies cultures with high risk-loving propensities are more likely to ensure their banking system stability.

The second quadrant at the top panel of Figure 4.1 represents the quantile relationship between long-term orientation and bank stability. In general, there is a significantly strong negative relationship between long-term orientation and bank stability at various levels. This implies that in regimes with a long-term planning focus, bank stability is likely stifled. In the subsequent analyses in this paper, we will see whether financial innovation can reduce the indirect implication of long-term orientation on bank stability.

In the third quadrant of the top panel, indications are that the level of indulgence has an inverted u-shaped relationship with the level of bank stability. At the median level of bank stability, the relationship between indulgence and bank stability is at a peak. Below the median level of bank stability, rising levels of indulgence have a positive impact on bank stability which

indicates that high risk-taking propensity among the community can harm reduce stability. Conversely, above the median level of bank stability, an increase in indulgence attenuates banking system stability. Therefore, the level of bank stability optimises the influence of bank stability and indulgence. Some indulgence levels are good for bank stability, but higher levels of indulgence can be detrimental to global bank stability.

The lower panel of Figure 4.1 shows the results of the relationship between power distance (PD), individuality (IND) and masculinity (MAS). The quantile relationship between PD and bank stability is rising at the lower levels of bank stability. As the level of stability falls, power distance positively affects bank stability. The result shows an indirect relationship between bank stability and power distance. Conversely, at the higher levels of bank stability, below the 80^{th} percentiles, higher power distance leads to lower bank stability. Beyond the 80^{th} percentile, rising power distance induces bank stability. The relationships between power distance and bank stability optimise at the 40^{th} quantile.

The second quadrant of the lower panel of Figure 1 shows that the relationship between Individualism and bank stability is U-shaped. At the lower level of bank stability, higher Individualism leads to a decline in bank stability. Between the 40^{th} and 80^{th} deciles, the relationship flattened and, after that, rose. The minimum threshold (60th decile of bank stability) optimises the relationship between Individualism and bank stability. Tajaddini and Gholipour (2017) found that mortgage borrowers from regimes with above-average Individualism are more likely to default on their mortgage agreement in both regular and crisis periods.

Finally, the last quadrant of the lower panel shows that at the 95% confidence level that there is a strong positive relationship between masculinity and bank stability. This translates to mean that male-dominated roles improve bank stability.

Table 4.4 depicts the GMM estimates on the role of the national culture in the effect of financial innovation on bank stability. The first column of the table has the acronyms of the variables. The above subjects are estimated from the second through to the six columns of the table. As stated earlier, the six national culture dimensions were decomposed into above-average and below-average dummies. The resulting dummies were interacted with the proxy for financial innovation to determine the collective impact on bank stability. The second to the seventh columns of Table 4.4 contains the above-average national culture dimensions and financial innovation levels. Similarly, the eighth to thirteenth columns include the interactions between the below-average culture dimensions and financial innovation on bank stability. We interpreted the role of national culture by adding the coefficients of the interaction terms to the coefficients of financial innovation for all estimations.

From the upper panel of Table 4.5, the lag of bank stability (BS (-1)) strongly impacts the current level of bank stability, confirming endogeneity. This shows that the previous year's bank stability has a rippling effect on the current situation of bank stability. Inflation has a positive impact on bank stability for all estimations. The implication is that the banks factor in the expected level of inflation in their liquidity and credit management to assuage the negative impact of rising prices on their intermediation operations. Similarly, trade openness (TRADE) has a strong positive effect on bank stability. Trade can provide the banks with diversified

clientele, reducing their sovereign risk and inducing more excellent stability. However, the level of bank concentration has an indirect impact on bank stability which implies that the drive for market share encourages the banks to engage in risky activities that have detrimental effects on bank stability. Large banks can increase the loan rates, which stifles liquidity and makes it harder for firms to honour their loan obligations (Pagano, 1993; Boyd et al., 2005).

From Column 2, high levels of indulgence (INDULH) have a strong negative moderation effect in the relationship between financial innovation and bank stability. Communities with a high level of indulgence are those with high risk-taking propensity. This means that risk-taking as an inherent quality in financial innovation can injure bank stability. Conversely, low indulgence plays a positive role in the relationship between financial innovation and bank stability. The result is in line with the established relationship between indulgence and bank stability in Figure 1 that indulgence positively impacts stability at the lower level of bank stability. The implication is that only low to moderate indulgence can promote financial innovation, leading to bank stability. The result is in line with Tajaddini and Gholipour (2017), who reported that borrowers from regions of high level of indulgence (low level of pragmatism) are more (less) prone to mortgage loan default.

Column EQ03 contains significant results for the interaction between financial innovation and long-term orientation. The joint effect shows that long-term exposure can dampen the effect of financial innovation on bank stability. The moderating effect of long-term orientation is negative which means it serves as a substitute to financial innovation in inducing bank stability. When financial innovation fails to achieve the desired results in financial intermediation, the

society's long-term focus can enhance bank stability. This assertion can be true because long-term planning can lessen the effect of liquidity or systemic shock emanating from the wrong sides of financial innovation.

Column EQ05 depicts the interaction's strong significant negative effect of financial innovations on bank stability for countries with above-average power distance. Members of such communities depend on top hierarchy people to inspire their decisions to embrace the diffusion of financial innovations. When such inspirations are not forthcoming, members of society may be reluctant to adapt changes in the financial environment which can circumvent the focus of financial innovation towards bank stability. Similarly, financial innovation is detrimental to bank stability for countries with a below-average levels of power distance which confirms the assertion that power distance communities may not induce financial innovation to promote bank stability. Boubakri et al. (2017) also found that banks operating in higher power-distance regimes would increase their performance during crises.

The last significant moderation effect examined is the role of uncertainty avoidance in the relationship between financial innovation and bank stability. Column EQ06 shows that financial innovation has a strong positive impact on bank stability for countries with an above-average levels of uncertainty avoidance. Conversely, financial innovation has a strong negative impact on bank stability for countries with a below-average levels of uncertainty avoidance. The results imply that communities with low to moderate risk tolerance can channel financial innovation into bank stability. High risk-tolerance cultures can cause financial instability with increased liquidity in the real sectors.

The implication is that low to moderate risk-tolerance societies positively impact bank stability when more credits are channelled into innovations. The results are consistent with Chen, Podolski and Veeraraghavan (2017), which found that firms with higher levels of uncertainty avoidance correlate with fewer and fewer patents and efficient research and development expenditure. The findings contrast with that of Ashraf et al. (2016) that risk-taking is high in countries with below-average uncertainty avoidance. In the same token, Boubakri et al. (2017) reported that banks operating in environments with higher uncertainty avoidance are more likely to increase their performance during crisis periods.

The last but one panel of Table 4.5 shows the effects of the time-dummies on bank stability. Essentially, we find that the period of the global financial crises (2007-2008) had strong negative effects on bank stability. The 2009 experienced an appreciable level of bank stability. However, structural shocks in liquidity also occurred in 2011 and 2014 after the recovery in 2012. The final panel of Table 4.5 contains the results of the Sargan Overriding Identity Tests, the Arellano and Bond Serial Correlation Tests, and the observations following the first differencing. The Sargan test determines whether the instruments included correlating with the term "innovation." The Sargan test's higher p-values demonstrate no conflicting identity and that the instruments are efficient because they do not correlate with the errors. Similarly, the high p-values of the AR(2) tests demonstrate that the estimations are free of serial correlations. The diagnostic tests indicate that the results and persistent endogeneity issues do not impair the results' efficacy.

4.5 Conclusion

This paper examined how national culture can help managers of financial institutions effectively channel new credits into productive sectors that can induce the soundness of the banking sector. We expect countries with a high level of indulgence, Individualism, and masculinity to cause more remarkable risk-taking behaviour among bank managers which can be detrimental to banking systems stability. Similarly, we expect countries with high levels of long-term orientation, power distance and uncertainty avoidance to make managers be risk-averse and hence take decisions that can induce banking system stability barring other external shocks. This study contributes to the literature by emphasising that national culture is critical in advancing and imitating the use of innovations in sound financial intermediation. The study reports that high levels of indulgence and uncertainty avoidance can induce a positive relationship between financial innovation and bank stability.

Conversely, high levels of long-term orientation and power distance dampen the impact of financial innovation on bank stability. We did not find any evidence that individuality and masculinity influence the effects of financial innovation on bank stability. The management of financial institutions should consider the cultural orientations of the societies within which they operate when advancing credit that would ensure sound financial systems. Central Banks should incorporate national culture dimensions into macro-prudential regulations to promote good banking systems. Further studies can investigate whether the insignificant role of Individualism and masculinity in the relationship between financial innovations and bank stability is due to the confounding effect of financial transparency in the credit market. It is also recommended that the researchers' community conduct further investigation into using the equity market since this study concentrated on the credit market.

CHAPTER FIVE

INSTITUTIONAL INNOVATION AND BANK STABILITY: DOES NATIONAL CULTURE MATTER?

5.1 Introduction

Financial innovation is classified into product, process, and institutional (Tufano, 2003). Product innovation includes commercialization of new deposits, credit insurance, leasing, and hire purchases, among other financial products. Process innovation involves the introduction of new banking technologies that assist in service delivery, such as internet banking, telephone banking, SMS banking, mobile banking, and automated teller machines (ATMs). Institutional innovations are also financial system innovations that include changes in business structure, the emergence of new financial institutions, and changes in regulatory framework (Abor, 2018). In the work of Abor (2018), financial innovations were also classified as price-risk-transferring innovations, credit-risk-transferring instruments, liquidity-generating innovations, credit-generating innovations, and equity-generating innovations based on the classification provided by the Bank of International settlement. On pages 35 and 36 of Abor (2018), the descriptions of these forms of financial innovation are provided as follows:

"*Price-risk-transferring innovations provide market participants with a more efficient means of dealing with price or exchange rate risk. Credit-risk-transferring instruments are instruments aimed at reallocating the risk of default. Credit transferring instruments are instruments aimed at reallocating the risk of default. Liquidity-generating innovations increase the market's liquidity, allow borrowers to draw upon new sources of funds, and allow market participants to circumvent capital constraints imposed by regulations. Credit-generating instruments are meant for increasing the amount of debt funds available to*

borrowers. Equity-generating instruments are instruments used to increase the capital base of financial and non-financial institutions (Abor, 2018, pgs. 35 and 36)".

This paper is about a private credit bureau, a financial system or institutional innovation which is helping in credit risk transfer, liquidity generation, credit generation and aiding in improving credit market outreach and transparency. The global financial crisis of 2007/2008 has re-ignited the calls for increased transparency in financial intermediation. Because of the development, many countries are establishing new financial outreach and transparency institutions to generate information that will help reduce moral hazards and adverse selection in credit advancement.

As a result, current discourses on the linkages between information-sharing institutions and financial solidity have emphasized the importance of transparency institutions in providing tangible information about borrowers' creditworthiness, which has enabled economies to lessen the risk of non-performing loans and boost liquidity in productive sectors. It has been demonstrated that information-sharing systems increase private sector credit (Djankov et al., 2007) and reduce net interest margins, implying that they lower the cost of credit and thus make credit more affordable to productive sectors (Kusi, Agbloyor, Gyeke-Dako, & Asongu, 2020).

There are compelling reasons for financial transparency institutions to be forward-thinking. Their primary responsibility of reducing information asymmetry and protecting participants in the intermediation process entails utilizing cutting-edge technology to uncover moral hazards

and adverse selection and relaying this information to financiers (Kusi et al., 2020). Due to the financial crisis, public transparency institutions are also urged to stay one step ahead of unscrupulous market participants to promote the financial system's soundness. Public credit registries have bolstered their monitoring, supervision, and regulatory requirements to avert a financial crisis. However, credit reference bureaus are known to be novel and have systems to produce comprehensive credit assessments than public credit registries which are hosted by many central banks (Djankov et al., 2007).

It follows that credit referencing bureaus can increase the effectiveness and efficiency in collecting and disseminating credit information. Financial transparency institutions risk losing relevance if they cannot generate high-quality borrower data. Financial transparency institutions require innovation to advise financiers on new loan screening processes that can identify entrepreneurial avenues for credit advancement in the manner proposed by the Schumpeterian models (Aghion, Howitt, & Meyer-Foulkes 2005; Laeven et al (2015). These models suggest that only firms with innovative projects would be identified by the screening processes of financiers for funding. Financial transparency institutions can help financials identify credible firms for funding which can improve the real sector productivity and sustain financial system soundness.

Other reasons why information sharing institutions should be promoted include. The development of information systems can relieve the banks of the need to spend significant sums on personnel and technology to screen borrowers. To avoid high cost the banks simply need to contract with a credible Credit Referencing Bureau at a reduced rate to obtain

information on prospective borrowers. This can help banks reduce their non-interest expenses (Kusi & Opoku-Mensah, 2018), lowering the cost of loans and thus the rate of loan impairment. Second, the development of information-sharing systems can potentially expand financial outreach regarding credit allocations, thereby promoting financial inclusion and avoiding tax invasion (Beck et al., 2014).

A bank may grant credit to a customer who does not have an account with the advancing institution by using an information sharing system. Even in uncertainty, the bank can rely on reference bureaus' data to identify less risky but profitable credit distribution channels. Additionally, information sharing systems provide information about borrowers' creditworthiness, assisting the banks in the channelling funds into productive sectors and credible borrowers, thereby reducing information asymmetry and ensuring sound intermediation because of credit risk reduction (Djankov et al., 2007; Kusi, Agbloyor, Ansah-Adu and Gyeke-Dako, 2017). This can boost liquidity that in turns induces economic activities and promoting sound financial intermediation. Finally, the increased transparency in the financial sector as the result of the emergence of private credit bureaus may result in a decrease in the net interest margin, which is beneficial for financial inclusion (Kusi, Agbloyor, Gyeke-Dako, & Asongu, 2020).

Furthermore, much of financial intermediation's failure has been attributed to information asymmetry – the possibility that unscrupulous borrowers with risky projects will apply for credit and then default on loan obligations – can put financial intermediaries' liquidity in jeopardy or result in massive non-performing loans, resulting in their instability (Ankerlof,

1970). As a result, financial institutions have developed screening technologies to weed out unsuitable borrowers from the credit market. When the screening process becomes unreliable, financiers can ration credit at equilibrium loan rates, even if interest rates increase (Stiglitz & Weiss, 1981). This presupposes that financial institutions must adopt advanced screening technologies to generate additional information about borrowers' creditworthiness to ensure sound intermediation. More importantly, new institutions have emerged that use cutting-edge technology to gather information about borrowers' creditworthiness and sell it to financial institutions.

On the other hand, because information sharing systems facilitate the flow of loanable funds, they can result in excessive liquidity and systemic risks, particularly when adverse economic conditions make it difficult for borrowers to repay their debts. Additionally, information sharing systems may induce financial institutions to relax their screening procedures and thus extend credit to risky borrowers. These incidents involving the inability of transparency institutions to detect information asymmetry can have serious consequences on sound intermediation and thus financial (in)stability (Boubakri et al, 2017).

Moreover, recent studies on the impact of information sharing systems on financial stability have found that information sharing improves tax compliance (Beck, Lin & Ma, 2014) and national productivity (Kusi, 2021), demonstrating the critical role of financial transparency in economic development. We contribute significantly to the discourse on the impact of financial transparency on financial (in)stability by demonstrating that the emergence of private sector-led transparency does not affect the stability of banking systems regardless of societies' level

of individualism, long-term orientation, or masculinity orientations as these are embedded in national culture.

As a result, the study bridges the divide between studies that demonstrate that national culture influences bank risk-taking behaviour (Boubakri et al., 2017; Cao, Sadok, Omrane, & Kwok, 2020; Mourouzidou-Damtsa, Milidonis, & Stathopoulos, 2017, Gaganis, Hasan, & Pasiouras, 2020) and those that link information sharing systems to banking outcomes by demonstrating that the national culture dimensions of individualism, long-term orientation and masculinity moderate the effect of private information sharing systems on bank stability. It emphasizes, therefore, that the effectiveness of credit reference bureaus in promoting sound financial intermediation is contingent on the degree of societal, and cultural orientation, which should guide policymakers' actions. Similarly, the study sought to find out whether the contextual framework for central bank supervision should be predicated on a nation's level of individualism, long-term orientation, and masculinity.

According to Hofstede's national cultural dimensions, national culture has an impact on a variety of financial embedment, including the choice of exchange rate regime (Cao, Sadok, Omrane, & Kwok, 2020), banks' risk-taking behaviour (Mourouzidou-Damtsa, Milidonis, & Stathopoulos, 2017), and mortgage financing (Gaganis, Hasan & Pasiouras, 2020). Nations differ in their approach to banking, and much of their perspectives on the activities of financial institutions can be attributed to the socialization of their citizens. In certain cultures, with a lower level of financial inclusion, members prefer not to deposit their money in banks because they believe that banking is the domain of the more privileged members. Due to a similar

belief, some members refrain from contracting for loans. As a result, we argue that the capacity of credit market transparency and outreach facilitated by the introduction of private information sharing systems to foster the development of sound financial systems can be influenced by the national cultural dimensions of societies.

There are numerous cultural dimensions, but Hofstede's national culture dimensions are most influential in explaining financial market participants' behaviour. Individualism refers to the degree to which a nation values individual risk-taking behaviour over the collective path of society members. Individualistic countries, as opposed to collectivist countries, are expected to incentivize members and thus handlers of financial institutions to make risky decisions with the potential for greater gain on the backside. Individuals living in individualistic societies tend to be risk-takers and, that borrow more money at higher interest rates.

However, this assertion does not imply that members of collective societies do not take risks. There is evidence that members of socialist societies are more likely to make risky financial decisions because they have family, community, or even the nation to support them if their decisions go wrong. Members of capitalist societies may be jittery in their financial decisions out of fear that if they fail, they will bear the pain of failure alone, without the support of their peers. The study focuses on three elements of national culture identified by Hofstede (1997, 2001): individualism, long-term orientation, and masculinity.

The study employed the first difference generalized method of moment analytical framework to account for reverse causality and achieve persistency of the results for 107 countries across

the period 2005-2017. The results show that given the policy variables used as control factors, national culture dimensions influence private information sharing systems to induce banking sector stability. The rest of the chapter contains the literature review, the methods, a discussion of the empirical results, and the conclusion.

5.2 Literature Review

Models exist to pinpoint that effective financial intermediation can be hampered by information asymmetry. Because of inadequate information about borrowers' intention, financiers are reluctant to advance credit to most productive sectors based on the assumption that some borrowers have incentives to default which can exacerbate the credit risk situation of the banks (Akerlof, 1970; Stiglitz & Weis, 1981). Moral hazards and adverse selection induce financiers to allocate credits at higher loan rates even in the wake of the credit boom so any arrangement to reduce information asymmetry can help distribute credits to productive sectors.

The premise is that a new institutional arrangement that can mitigate the lack of information about borrowers' credit worthiness would assist in making more credits to the productive sectors at cheaper costs. The emergence of information-sharing institutions can reduce information asymmetry and help boost liquidity to support productive sectors (Djankov et al.,2007). Credit information provides “reputation collateral” to limit the requirements of “physical collateral”, thereby inducing the productivity of firms (Miller, 2018).

However, overreliance on credit information systems can harm the soundness of the banking system. Jappelli and Pagano (2000) offer two main avenues through which credit information

systems can induce bank instability. Firstly, it is difficult for borrowers to honour their loan obligations in countries characterised by dominant informal sectors, even with credit transparency systems. Their second argument is that over-reliance of credit information systems can cause the banks to relax collateral requirements in lending and use information from credit bureaus/registries to lend more. Eventually, the banks begin to diversify their loan portfolios, especially under intense competition leading to bank failure. This means that credit information systems can induce competition in the credit markets and increase the risk-taking behaviour of banks (Dell'Aricia, 2000; Allen & Gale, 2004).

In Ghana, Kusi, Dzeha, Gyan, and Turkson (2020) used data on 20 listed non-financial firms from 2003 to 2013 to show that information-sharing systems have a strong positive (negative) effect on short-term debt financing (long-term debt financing). The authors suggested that there is an indirect effect of credit information sharing on long-term financing due to the under-developed nature of the transparency institutions in Ghana, which suggests that culture can plays a critical role in ensuring that information sharing systems improve access to finance by firms in the long-term. In a related study, Kusi, Agbloyor, Fiador, and Osei (2016) showed that information sharing induces bank performance by lowering bank loan assessment and monitoring costs. The authors however did not examine the role of culture in fostering financial transparency into the banking system soundness, which is the focus of this paper.

In addition, one environmental factor that can affect the effect of credit transparency systems on bank stability is the cultural orientation of countries that affects bank managers' decisions. Some countries have the inclination for individualistic tendencies to induce economic

activities. Such societies encourage individuals or groups to take risks. Intuitively and indeed from extant studies, one would expect that societies with high levels of individualism would boost the confidence of managers of banks to engage in risk-taking behaviour, especially in the wake of enhanced transparency in the credit market (Kanagaretnam et al., 2013; Ashraf et al., 2016; Mourouzidou-Damtsa et al., 2019; Díez-Esteban et al., 2019). However, the cushion hypothesis stipulates that societies with a high level of collectivism can provide support systems that induce members of the society to be risk-lovers.

The seminal analysis shows that the collective societal members can engage in risk-taking behaviour due to the awareness of social support (Hsee & Weber, 1999; Weber & Hsee, 1998a, b). According to Hsee and Weber, a comparative study on students from China and America found that the Americans were more risk averse compared to students from China who were less risk averse. The outcome that Chinese children were more risk-loving was surprising because people expected American children should instead be risk-loving because they were trained in an environment that encourages innovation and creativity (Hsee & Weber, 1997). The authors hypothesized that cultural variations between the two countries could explain the observed disparities in risk choices.

To explain their findings, Hsee and Weber proposed the "cushion hypothesis," which goes to emphasize their findings that Chinese citizens, will receive financial assistance in times of need compared to citizens from the United States (Hsee & Weber, 1999). It follows that because of transparency systems in place in most countries, financial institutions rely on information-sharing systems to grant more loans to individuals and businesses. By controlling for the

confounding effect of corporate governance, Illiashenko and Laidroo (2020) found that individualism hurts banks' risk-taking behaviour, confirming the Cushing hypothesis.

The second characteristic of national culture discussed in this study is long-term/short-term orientation, which is explained as the extent to which traditions are maintained or defended over the long term, rather than accepting future problems. A society with low levels of long-term values adheres to rules and customs and is less inclined to prioritize current and future issues, and these communities are less receptive to change. Instead, long-term-oriented cultures accept change and prepare for the future. Communities focused on the short term are termed normative, and communities focused on the long term are considered pragmatic. A low score for long-term orientation indicates that countries adhere to traditions, have a lower proclivity to invest for the future, and value immediate gratification. This may influence their openness to innovations that contribute to the stability of banking institutions.

Haq, Hu, Faff, and Pathan (2018), Hofstede and Minkow (2010), Doney et al. (1998), Zheng et al. (2012), and Lievenbrück & Schmid (2014) discussed how the degree of a society's long-term orientation (LTO) could affect financial management concerns. Hofstede and his co-authors proposed that children in LTO countries learn to be frugal and resist the temptation to seek immediate gratification. On the other hand, they emphasised that children educated in short-term-oriented communities usually demonstrate a desire for immediate pleasure, excessive spending, and susceptibility to peer pressure when it comes to consumption. Similarly, long-term cultures promote self-discipline, but short-term societies value independent thought (Hofstede & Minkov, 2010).

The other scholars have confirmed that cultures focused on the long term are more risk averse. Doney et al. (1998) underlined that LTO cultures are less prone to opportunistic entrepreneurship because they are more long-term oriented and focused on a longer horizon and performance. Similarly, Zheng et al. (2012) asserted that organizations with a high LTO are more visionary, emphasizing adaptability. As a result, these enterprises are not forced to rely on long-term funding. From a risk management perspective, LTO-defined societies place a premium on a firm's long-term viability, which results in higher hedging (Lievenbrück & Schmid, 2014).

Financial leverage will decrease because of the LTO, as Haq, Hu, Faff, and Pathn (2018) discovered. However, banks operating in short-term-oriented societies face greater risk than those operating in long-term-oriented cultures. Bank managers in such short-term-oriented cultures would be more inclined to use information obtained from financial transparency institutions during loan processing to prevent credit risks. Businesses must make less risky decisions to maintain employment stability. In a short-term-oriented society, managers are more likely to supplement internal credit screening with information from credit transparency institutes. In a short-term-oriented society, managers would increase internal credit screening with information from credit transparency institutes.

Masculinity (MAS) is a psychological term that assesses how forceful, competitive, and successful male attributes are rewarded (Hofstede, 1984). Societies with a high MAS score exhibit greater achievement-oriented behaviour than those with low MAS scores. On the other

side, femininity embodies characteristics such as modesty and sympathy for the vulnerable. Males exhibit greater risk-seeking behaviours in financial decision-making than females (Powell & Ansic, 1997) and are more prone to self-attribution or overconfidence (Powell & Ansic, 1997).

Male behaviour is often associated with persons who seize opportunities, which is consistent with the physical gender distinction (Doney et al., 1998). Based on the above, we state that bank managers in societies that prefer male-dominated qualities (as in developing countries) are more likely to seek transparency in credit allocation to avoid bank instability. National culture can also indirectly affect a company's performance and risk-taking by influencing regulatory and institutional structures and subsequent business management practices (Leaven & Levine 2009; Carretta et al. 2014; John et al. 2008; Acharya et al. 2011).

5.3 Methods

Secondary data on the variables were gathered from the Global Financial Development Database (2020), the World Development Indicator (WDI) (2020), and Hofstede's Insight Online Edition. The GFDD made bank concentration (BC) and the Z-score available (BS). The WDI collects data on a variety of control variables, including GDP per capita (GD), inflation (INF), trade openness (TRADE), and mobile phone coverage (MOB). We derived data on the dimensions of national culture from Hofstede's National Culture database. The study spans the years 2005 to 2017. Including 107 countries results in 1391 observations for the panel data structure. However, we had unbalanced data because certain observations are missing from the dataset. There is reason to think that the imbalanced character of our dataset will have no effect on our estimates' efficiency, given that the generalised methods of moment (GMM) technique

accounts for such irregularities by estimating variables using their initial differences. Regardless, the GMM technique's first differencing results in the loss of a degree of freedom. The empirical section demonstrates that the degree of freedom for all our GMM estimations falls below 1000.

The study employed the Dynamic Generalized Method of Moments (GMM) to examine the role of national cultural factors on the linkages between financial innovation and bank stability. The advantages of the GMM approach include the reduction of endogeneity, heteroskedasticity, and serial correlation. The GMM model necessitates using instruments connected to the explanatory variables but unrelated to the error term. As transformed instruments, the initial lags of the explanatory variables were employed. The six dimensions of national culture for the untransformed instruments were also used. The Sargan test of overriding identity to address the issue of endogeneity was undertaken. The Sargan test's null hypothesis asserts that the instrument was endogenous, meaning it was corrected for explanatory variables but left uncorrected for the error term.

Similarly, the Arellano-Bond AR (2) test was utilised to assess the presence or absence of serial correlation. An insignificant p-value (P-value greater than 0.05) indicates this test's absence of serial correlation. The GMM technique considered the dependent variable's lags (bank stability) as endogenous, and the following model is stated (See Equation 5.1). Secondary data on the variables were compiled using the Global Financial Development Database (2020), the World Development Indicator (WDI) (2020), and Hofstede's Insight Online Edition. The GFDD produced data on bank concentration (BC) and the Z-score (BS). The World

Development Index (WDI) includes data on key development indicators such as GDP per capita (GD), inflation (INF), trade openness (TRADE), and mobile phone coverage (MOB).

The data on national culture was gathered from Hofstede's National Culture database. The study runs from 2005 to 2017. The overall number of countries represented is 107, resulting in a panel data structure with 1391 observations. However, we had unbalanced data because certain observations are missing from the dataset. Because the generalised methods of moment (GMM) technique accounts for such anomalies by estimating variables using their first differences, there is reason to believe that our dataset's unbalanced nature will not affect the efficiency of our estimations. Regardless, the first differencing process of the GMM approach led to the loss of a degree of freedom. As demonstrated in the empirical section, all our GMM estimations have a degree of freedom of less than 1000.

5.3.1 Model Specification

To achieve the paper's purpose of incorporating national cultural factors into the effect of financial innovation on bank stability, the researcher used dynamic generalised method of moments (GMM) estimation techniques. The GMM approach effectively reduces endogeneity, heteroskedasticity, and serial correlation. In the GMM model, instruments that are related to the explanatory variables but unrelated to the error term are required. The initial lags of the explanatory variables were used as transformed instruments. For the untransformed instruments, we employed the six dimensions of national culture. To tackle the issue of endogeneity, we applied the Sargan test of overriding identity. The Sargan test's null hypothesis

suggests that the instrument was endogenous, which was adjusted for explanatory variables but left uncorrected for the error term.

Similarly, to address the issue of serial correction, we assessed the presence or absence of serial correlation using the Arellano-Bond AR (2) test. A higher p-value (P-value larger than 0.05) shows that this test does not detect serial correlation. The GMM technique treated the dependent variable's lags (bank stability) as endogenous, and the model was formulated as follows:

$$BS_{it} = \alpha_0 + BS_{it-1} + \sum_{c=1}^{n} \beta_c Control\ Var_{it} + \sum_{f=1}^{n} \beta_f ISS_{it} + \sum_{fi=1}^{n} \beta_{fi} ISS * NCD + \sum_{i=1}^{n} \beta_i NCD_{it} + v_t + u_{it} \quad (5.1)$$

where BS is bank stability measured using z-score. Control var is the set of control variables, namely, GDP per capita (GDP), inflation (INF), technological infrastructure coverage (MOB), Trade openness (TRADE) and bank concentration (BC). ISS is information sharing systems (private credit bureau/public credit registry), NCD is the national culture dimensions, v_t are the year effects; and u_{it} is the error term.

GDP per capita was added since a country's income influences economic activity and can influence enterprises' decisions to develop, sell their products, and spend a portion of the earnings on repaying loan obligations. Inflation can increase borrowing costs, lowering businesses' willingness to seek further financing from banks. Cellular penetration is a proxy for the technological infrastructure and adoption of services such as internet banking, SMS

banking, mobile money banking, mobile banking, and bank transfers. Openness to trade serves as a proxy for the extent to which globalisation has resulted in the spillover impact of shocks from interdependent economies, resulting in financial instability. Finally, the level of bank concentration was included because it influences banks' competitive behaviour, which in turn influences their risk-taking behaviour. The GMM approach is appropriate for this study since our dataset has time series dimensions smaller than cross-sections.

5.4 Empirical Results

Table 5.1 has the results for the analyses that centre on the distribution of high – and low levels of the three national culture dimensions used in this study. The national culture dimensions are measured from 0 to 100, with values close to 100 deemed as high values. However, we used the mean values of the dimensions as yardsticks to determine whether a country's observation falls within the high or low dimensions. Accordingly, values below the mean were classified as low, and values above the mean were classified as high. Subsequently, dummies, which takes 1 for a group and 0 if otherwise, were created to assume countries into their respective high or low dimensions. These classifications are necessary because Hofstede measures dimensions from low to high. What is surprising is that most of the empirical studies used the scores of the dimensions and inferred whether the results were induced by the high – or low levels based on the sign of the coefficients (for example, Haq et al., 2018). In the analyses, the dummies interacted with the measures for private credit bureaus coverage and the ensuing coefficients of the interaction terms were added to the coefficient of the information sharing measure and interpreted as the net effect of the role of national culture in the relationship between information sharing systems and bank stability.

Columns EQ01-EQ06 depict the results with GDP, inflation, trade openness, mobile phone subscription and bank concentration as control variables. We found positive but insignificant statistical evidence that financial transparency through the proliferation of private credit bureaus has any effect on bank stability measured by the z-score (see column EQ01). The result portrays that information from credit scoring bureaus do not have direct impact on the banking sector soundness for the economies used in the study. These results normatively mean that the banks should rather invigorate their internal credit screening systems as they use information from the transparency institutions to induce bank stability. The result contradicts the evidence in most of the extant empirical studies, which may suggest that private credit bureaus positively influence financial stability (Léon & Guérineau, 2018; Büyükkarabacak & Valev, 2012). However, since culture can impact how people accept changes in society and therefore it can influence the use of credit scoring systems to affect banking sector soundness, the subsequent investigation sought to examine whether national culture elements such as individualism, long-term orientation and masculinity can have enduring impact on the association between credit market transparency and bank stability.

The second and sixth columns of Table 5.1 (EQ02 and EQ06) have results for the role of high – and low levels of individualism in the impact of national culture on bank stability. The joint effect shows that countries with high and low levels of individualism use information sharing systems to induce bank stability which can be translated to mean that banks in countries with a high level of individualism increase their risk-taking behaviour because of the existence of credit market transparency. These results are contrary to the cushion effect hypothesis, which

stipulates those systems that promote collectivism are more likely to induce bank's risk-taking behaviour because of the availability of social support for failure (Hsee & Weber, 1999; Weber & Hsee, 1998a, b, Illiashenko & Laidroo, 2020). The results suggest that information transparency provides a shield for managers of banks to engage in businesses which would otherwise induce the instability of the banks. It follows that, in most countries, the emergence of credit scoring systems serves as a substitute for increasing risk-taking for bank managers in individualistic societies, which can dampen banking system instability.

Moreover, Column EQ03 shows that bank instability for countries with high long-term orientation in the wake of financial transparency can increase financial outreach. Bank managers in societies with long-term orientation are quick to adapt to change, which may make them more risk-loving and therefore use less of new information-sharing institutions to induce bank stability. In contrast, column EQ06 shows that managers in countries with a low level of long-term orientation engage in behaviour that induces bank stability when they use information from credit rating institutions. These managers are likely to be risk-averse and therefore carefully evaluate loan applications based on information provided by private credit bureaus to avert financial instability.

The result for masculinity demonstrates that countries that exhibit high levels of masculinity promote bank stability using the coverage of credit bureaus. This implies that countries that emphasise male-dominated decision-making tendencies are likely to use credit market transparencies to induce banking system stability. however, the last column of Table 5.1 shows that countries with feminine qualities in decisions induce a strong negative impact of

information transparency on bank stability, suggesting that because of the existence of credit bureaus, managers of such societies are more willing to take risk decisions to induce bank stability. Haq et al. (2018) found that masculinity has a negative effect on firms' capital structure, suggesting that masculinity deter firms' managers from going for financial leverage.

Table 5.1: The role of national culture in the relationship between private credit bureau and bank stability

Eq Name:	EQ01	EQ02	EQ03	EQ04	EQ05	EQ06	EQ07
Method:	GMM	GMM	GMM	GMM	GMM	GMM	GMM
Dep. Var:	BS	BS	BS	BS	BS	BS	BS
BS(-1)	0.3356**	0.3707**	0.3314**	0.3635**	0.3826**	0.3454**	0.3635**
	(0.0204)	(0.0291)	(0.0263)	(0.0292)	(0.0290)	(0.0258)	(0.0292)
GDP	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
INF	0.0142*	0.0485*	0.0438	0.0273	0.0457	0.0432	0.0273
	(0.0061)	(0.0243)	(0.0244)	(0.0235)	(0.0244)	(0.0241)	(0.0235)
		-	-		-	-	-
MOB	-0.0353**	0.0332**	0.0432**	-0.0422**	0.0324**	0.0426**	0.0422**
	(0.0042)	(0.0067)	(0.0052)	(0.0077)	(0.0069)	(0.0050)	(0.0077)
TRADE	0.0326**	0.0060	0.0274**	0.0265**	0.0048	0.0260**	0.0265**
	(0.0038)	(0.0086)	(0.0081)	(0.0072)	(0.0085)	(0.0080)	(0.0072)
		-	-		-	-	-
BCON	-0.1268**	0.1491**	0.1451**	-0.1347**	0.1444**	0.1398**	0.1347**
	(0.0091)	(0.0127)	(0.0119)	(0.0128)	(0.0126)	(0.0117)	(0.0128)
						-	
PCB	0.0098	-0.0193*	0.0558**	-0.0185*	0.0430	0.0172**	0.0449*
	(0.0061)	(0.0083)	(0.0150)	(0.0087)	(0.0264)	(0.0061)	(0.0211)

PCB*INDH		**0.0613***					
		(0.0285)					
PCB*LTOH			**-0.0736****				
			(0.0157)				
PCB*MASH				**0.0635***			
				(0.0256)			
PCB*INDL					**-0.0627***		
					(0.0289)		
PCB*LTOL						**0.0715****	
						(0.0154)	
PCB*MASL							**-0.0635***
							(0.0256)
Observations:	784	740	740	740	740	740	740
Sargan	0.307	0.359	0.376	0.462	0.367	0.369	0.462
AR(2)	0.091	0.999	0.0318	0.999	0.999	0.044	0.999
Instrument rank	78	78	78	78	78	78	78
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes

*BS is Bank stability, GDP is GDP per capita, INF is inflation, MOB is mobile/cellular phone subscription, TRADE is trade openness, BCON is bank concentration, PCB is private credit bureau coverage per 100 of population, INDH is high level of individuality, LTOH is high level of long-term orientation, MASH is high level of masculinity, INDL is low level of individuality, LTOL is low level of long-term orientation and MASL is low level of masculinity. **significance at 1% level and *significance at 5% level.*

5.5 Conclusions

Financial system transparency is crucial for reducing credit risks, boosting liquidity, reducing financial intermediation costs, and promoting sound financial systems. In many countries, private credit bureaus have been instituted to augment the work of central banks' monitoring

and supervision systems such as public credit registries to promote sound banking and protection of credit market participants. Prior studies suggested that information systems to increase transparency and credit transmission. This paper contributes to the discourse by adding that institutional arrangements to promote financial transparency and outreach can reduce information imbalance and ensure sound financial systems. The contribution is that nations' cultures can influence bank managers' decisions to use information-sharing systems to promote banking system stability.

The paper explored the moderating role of Hofstede's dimensions of individualism, long-term orientation, and masculinity on the linkage between information sharing systems and bank stability. Because individualism promotes individual achievement and risk-taking, the study expected managers in highly individualistic countries to use private credit bureaus to promote bank stability. Similarly, since long-term orientation relates to very structured, forward-looking, and focused societies, the study expected managers in high long-term-oriented societies to use private credit bureaus to increase bank stability. By the same token, since masculinity relates to societies that promote male-dominated behaviour that implies greater risk-taking, the study expected managers in societies with high masculinity to use private credit bureaus to reduce bank instability.

Eventually, it was discovered that by the dynamic GMM method, private credit bureaus' impact on bank stability was not significant. However, by relying on the culture in the societies within which they operate, bank managers can use credit bureaus to affect bank stability. Our findings reveal that managers in societies with high-level of individualism and masculinity and

low levels of long-term orientations can use private information sharing systems to induce banking system stability. Instead, the use of private information sharing systems to induce bank stability can be attenuated (increased) in societies with a high level of long-term orientation (high short-termism), low levels of individualism (high collectivism) and low level of masculinity (high feminism). The results mitigate the cushion hypothesis, which suggests that collective societies motivate economic agents to increase their risk-taking behaviour, which can induce bank instability. The result shows that risk-taking behaviour reduces in individualistic societies because such societies use private information sharing systems in credit transmission.

The implication is that despite the existence of private credit bureaus in our sampled countries, bank managers must leverage the cultural orientation of their host countries before making decisions on liquidity and credit management to guarantee a more reliable banking system. Central banks must be encouraged to use information from information-sharing systems when regulating banks' risk-taking behaviour but that should be with recourse to whether the host countries culture encourages more risk-taking or not.

CHAPTER SIX

CONCLUSIONS AND GENERAL POLICY RECOMMENDATIONS

6.1 Introduction

Activities of banks, no doubt, are essential in boosting economic activities. It is also without doubt that when financial institutions face challenges, the rippling effect on economies is devastating. Researchers have built a pyramid of evidence to show that banking system instability is a prime cause of financial crises. On the positive side, a stable banking system is instrumental for financial and economic stability and productivity growth. However, after the financial crisis that engulfed the world in 2007/2008, the focus of research studies shifted to steadiness in the banking system of economies around the world.

In their study, as the literature review section reveals, many factors have been attributed to bank stability. Bank stability has been attributed to bank manager's risk-taking behaviour, and the mounting of evidence shows that banking market structure, financial stability, macroeconomic factors, monetary policy, sovereign debt servicing, and financial innovations in the form of securitization are responsible for banking system stability or its counterpart, banking system instability. Before proceeding to this study, the researcher realized that the boom in credit to support technological innovation had not been much considered in the factors that lead to bank (in) stability. Historically, researchers have not traced the channel through which national culture dimensions, which are the dominant force in determining economic choices, can induce the channel through which a boost in credit distribution to induce technological innovation could affect banking system stability.

The study focused on examining the impact of bank innovation on bank stability, the role of innovation in the bank innovation and bank stability transmission process and established the effect of national culture on bank stability. Data for the study was obtained from 107 per capita income club countries. The Dynamic Generalized Method of Moment (GMM) with a fixed period was used to analyse the data.

6.2 Summary of Major Contributions

This thesis adds to what has already been written severally: First, using a larger cross-sectional sample of 107 countries, the researcher finds strong evidence that the growth in credit to support technological innovation that would lead to global banking system stability does not depend on the income-clubs of countries. This result goes against the theory of Aghion et al. (2005) and Laeven et al. (2015), which says that technically advanced countries are the only ones that can develop their financial markets to cause growth in credit to support technological innovation, which would boost productivity growth.

Second, the thesis makes the case that bank managers use the national culture orientation of the countries where they work as collateral to spread credit into technological innovations that would stabilise the banking system. The study tries to show that too much credit might not always lead to financial instability, as has been said in the existing literature, if bank managers consider the national culture of the countries where they work. So, the study makes a strong case that if managers want to promote sound banking systems, they shouldn't change the banking system to make more and better loans without considering national culture. So, the study fills the gap between those that look at how financial innovation (in the form of credit

creation) affects bank stability and those that look at how national culture affects how banks take risks.

The third major contribution of the thesis to the existing literature is that it shows how changes in the financial system, such as the rise of private credit bureaus, can help reduce information asymmetry. The reduction in information asymmetry, in turn, allows bank managers to give more loans to productive sectors without hurting good banking practices or the banking system's stability. This claim is based on the idea that better information about the quality of the borrower can lower the loan rate, giving entrepreneurs more power to get cheaper loans that can be paid back to avoid loan impairment and, by extension, bank instability.

6.3 Findings and Conclusions

6.3.1 Impact of Innovation on Bank Stability across Income Clubs

The empirical study of banks' innovation and stability in per capita income clubs used country-level data from the Global Financial Development Database (2019) and the World Development Database (2019) for 107 countries, with observations from 2005 to 2017. For the analysis, the Dynamic Generalized Methods of Moment were used. In the sample countries, stability is linked to bank stability in a good way. It also showed a stronger link between financial innovation and bank stability in Upper-Middle Income countries. But the same could not be said for countries with less money. The results also show that concentration among banks is bad for stability. The study also showed that financial innovation makes banks less stable during a crisis, and during regular times, it was found that financial innovation makes banks more stable.

The study found that the banking system's stability can be helped by the growth of financial resources that firms can use to fund their own business activities. But there is not much

evidence for the different income clubs, which suggests that there is a global advocate for sending money to productive sectors to ensure that financial systems are sound. We didn't find enough evidence that differences in per capita income explain how financial innovation affects bank stability. This shows that helping the private sector grow is good for bank stability everywhere. But not every new financial idea is directly good for the stability of banks. Putting money into ATM coverage doesn't have a direct effect on how stable a bank is. This could be because ATMs are used to provide financial services, which may not send money to areas that are useful. Too many ATMs can also lead to net withdrawals, which can increase the amount of cash in the system, cause liquidity problems for banks, and make banks less stable. In the future, researchers can look at what level of ATM coverage is best for the stability of banks in different countries and income groups.

6.3.2 The Role of National Culture in the Innovation-Stability Nexus

This paper looked at how a country's culture can help managers of financial institutions get new loans into productive areas, which can make the banking sector more stable. We think that bank managers in countries with a lot of indulgence, individualism, and masculinity will take more risks, which can be bad for the stability of the banking system. In the same way, we expect that managers in economies with that exhibit long-term thinking, power distance, and avoiding uncertainty will be risk-averse and make decisions that can keep the banking system stable, barring other shocks from the outside. The study contributes to advances made in literature by showing how important national culture is for advancing and copying the use of innovations in good financial intermediation. According to the study, a strong link between

financial innovation and bank stability can be caused by high levels of indulgence and avoiding uncertainty.

Contrary to earlier findings, financial innovation has less of an effect on bank stability when there are high levels of long-term thinking and power distance. We didn't find any proof that individuality and masculinity affect how new financial ideas affect the stability of banks. When giving out credit, the people in charge of financial institutions should consider the cultures of their workplaces. This would help make sure that the financial systems are safe. Central Banks should make sure that macro-prudential regulations include aspects of national culture to help create good banking systems. Individualism and masculinity don't seem to have much influence on the association among financial innovations and bank stability. More research could investigate whether this is because of the confusing effect of financial transparency in the credit market. Since this study focused on the credit market, it is also suggested that the research community do more research on how to use the equity market.

The main goal of this empirical study was to figure out what role national culture plays in the link between financial innovation and bank stability. Secondary data on the variables of interest were gathered from the Global Financial Development database (2020), the world development indicator (2020), and Hofstede's insight online edition. The study looked at 107 countries, and 1391 observations were made as part of the panel data structure. The study's results showed that different per capita income clubs have different national culture dimensions.

It is expected that bank managers in countries with a lot of indulgence, individualism, and masculinity will take more risks, which can be bad for the banking system's stability. In the same way, managers in countries with high levels of long-term thinking, power distance, and avoiding uncertainty are less likely to take risks and more likely to make decisions that can keep the banking system stable, barring other shocks from the outside. According to the study, a strong link between financial innovation and bank stability can be caused by high levels of indulgence and avoiding uncertainty. It also established that financial innovation has less of an influence on bank stability when there are high levels of long-term thinking and power distance. We didn't find any proof that individuality and masculinity affect how new financial ideas affect the stability of banks.

6.3.3 Institutional Innovation and Bank Stability: Does National Culture Matter?

In the third empirical study, researchers looked at whether national culture affected the link between institutional innovation and bank stability. To do this, secondary data on the variables were gathered from the Global Financial Development Database (2020), the World Development Indicator (WDI) (2020), and Hofstede's Insight Online Edition. The GFDD gave people access to the bank concentration (BC) and the Z-score (BS). The WDI collects data on several control variables, such as GDP per capita (GD), inflation (INF), trade openness (TRADE), and mobile phone coverage (COVER) (MOB). Hofstede's National Culture database gave us information about the different parts of national culture. The period of the study is from 2005 to 2017. When 107 countries are added to the panel data structure, there are 1391 observations.

The results show that financial transparency through the growth of private credit bureaus has some effect on bank stability. Still, the effect is small and not statistically significant. Further, it was found that national cultural factors like individualism, a focus on the long term, and masculinity have a long-lasting effect on the link between credit market transparency and bank stability. The study found that countries with high levels of individualism and countries with low levels of individualism use information-sharing systems to stabilise banks. The result for masculinity shows that credit bureaus help countries with a high level of masculinity keep their banks stable. Information transparency has a strong negative effect on bank stability in countries where women make decisions. This suggests that because of credit bureaus, managers in these countries are more willing to make risky decisions to keep banks stable. So, the study concludes that institutional arrangements that promote financial transparency and outreach can reduce information imbalance and ensure that financial systems are sound. Also, a country's culture can affect whether bank managers use information-sharing systems to make the banking system more stable.

Transparency in the financial system is important for lowering credit risks, increasing liquidity, lowering the costs of financial intermediation, and making sure that financial systems work well. In many countries, private credit bureaus have been set up to help the central banks' monitoring and supervision systems, like public credit registries, do their jobs better. This is done to promote good banking practices and protect people who use the credit market. We think that information systems will make things clearer and easier for people to get credit, and they will also make banks more stable because they can reduce credit risk. This paper adds to the discussion that setting up institutions to promote financial transparency and communication

can help information gaps and ensure that financial systems are sound. The main point of the paper is that a country's culture can affect whether bank managers decide to use information-sharing systems to make the banking system more stable.

The chapter looked at how Hofstede's dimensions of individualism, long-term orientation, and masculinity affect the relationship between information-sharing systems and bank stability. Individualism encourages people to be successful and take risks, so we expect managers in countries with a lot of individualism to use private credit bureaus to make banks more stable. Also, since long-term orientation is linked to very structured, forward-looking, and focused societies, we expect managers in societies with a lot of long-term orientation to use private credit bureaus to make banks more stable. In the same way, since masculinity is linked to societies that encourage male-dominated behaviour, which means taking more risks, we expect managers in societies with a high level of masculinity to use private credit bureaus to reduce bank instability.

Using the dynamic GMM method, it was found that private credit bureaus don't have a big effect on how stable a bank is. But bank managers can use credit bureaus to affect bank stability by considering the culture of the societies in which they work. My research shows that managers in societies with high levels of individualism and masculinity and low levels of long-term thinking can use private information sharing systems to stabilise the banking system. On the other hand, the use of private information sharing systems to make banks stable can be decreased (increased) in societies with high levels of long-term orientation (high short-termism), low levels of individualism (high collectivism), and low levels of masculinity (high

feminism). The results disprove the cushion hypothesis, which says that people live in groups are more likely to take risks, which can lead to bank instability. The result shows that people take fewer risks in individualistic societies because they use private systems to share credit information.

The implication is that, even though our sampled countries have private credit bureaus, bank managers must consider the culture of their host countries before making decisions about liquidity and credit management. This is to make sure that the banking system is safe. When regulating how banks take risks, central banks should be pushed to use information from systems that share information.

The study concludes that institutional arrangements to improve financial transparency and communication can reduce the imbalance of information and make sure that financial systems are sound. The study also concludes that a country's culture can affect whether bank managers decide to use information-sharing systems to make the banking system more stable.

6.4 Policy Recommendations

Based on the findings of the study, the following recommendations are made:

The study found that globally, the growth in financial resources to finance the entrepreneurial activities of firms can lead to the banking system's stability. However, the evidence for the various income clubs is weak. In furtherance of this, the study advocates for global continuous channeling funds to productive sectors to ensure sound financial systems.

The management of financial institutions should consider the cultural orientations of the societies within which they operate when advancing credit that would ensure sound financial systems. Central Banks should incorporate national culture dimensions into macro-prudential regulations to promote good banking systems.

It is further recommended that despite the existence of private credit bureaus in our sampled countries, bank managers must leverage the cultural orientation of their host countries before making decisions on liquidity and credit management to ensure the soundness of the banking system. Central banks must be encouraged to use information from information-sharing systems when regulating the risk-taking behaviour of banks.

6.5 Areas for Further Research

Further studies can investigate whether the insignificant role of Individualism and masculinity in the relationship between financial innovations and bank stability is due to the confounding effect of financial transparency in the credit market. It is also recommended that the researchers' community conduct further investigation into using the equity market since this study concentrated on the credit market.

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APPENDICES

Appendix 1: Unit Root Tests

UNIT ROOT TEST (ADF)

Null Hypothesis: the variable has a unit root

At Level

		FIN	GDP	INF	TRADE
With Constant	t-Statistic	0.1359	0.1100	0.0292	0.9570
	Prob.	***0.0242***	***0.0659***	***NA***	***0.8000***
		**	*	***	n0
With Constant & Trend	t-Statistic	0.0170	0.9121	0.1190	0.0235
	Prob.	***0.0884***	***0.4121***	***NA***	***0.0255***
		*	n0	***	**
Without Constant & Trend	t-Statistic	0.0246	0.5860	0.0028	0.3575
	Prob.	***0.0049***	***0.8923***	***NA***	***0.0044***
		***	n0	***	***

At First Difference

		d(FIN)	d(GDP)	d(INF)	d(TRADE)
With Constant	t-Statistic	0.0010	0.4365	0.0023	0.0891
	Prob.	***0.0029***	***0.0293***	***NA***	***0.0062***
		***	**	***	***
With Constant & Trend	t-Statistic	0.0062	0.2634	0.0088	0.2830

	Prob.	***0.0180***	***0.0900***	***NA***	***0.0466***
		**	*	***	**
Without Constant &					
Trend	t-Statistic	0.0000	0.0607	0.0001	0.0260
	Prob.	***0.0001***	***0.0025***	***NA***	***0.0019***
		***	***	***	***

Notes:

a: (*)Significant at the 10%; (**)Significant at the 5%; (***) Significant at the 1% and (no) Not Significant

b: Lag Length based on SIC

c: Probability based on MacKinnon (1996) one-sided p-values.

Appendix 2: Results on the relationship between the cultural dimensions and bank stability

Eq Name:	EQ01	EQ02	EQ03	EQ04
Method:	GMM	GMM	GMM	GMM
Dep. Var:	BS	BS	BS	BS
BS(-1)	1.0113	1.0473	1.0221	1.0118
	(0.0098)**	(0.1159)**	(0.0263)**	(0.1743)**
GDP	0.0000	0.0000	0.0000	0.0000
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
INF	0.0104	0.0093	0.0152	0.0138
	(0.0287)	(0.0589)	(0.0379)	(0.0704)
MOB	-0.001	0.0021	-0.0018	-0.0011
	(0.0023)	(0.0068)	(0.0029)	(0.0065)
TRADE	0.0011	-0.0015	0.0004	0.001
	(0.0011)	(0.0050)	(0.0014)	(0.0052)
BCON	0.0012	0.0019	0.0024	0.0020
	(0.0049)	(0.0076)	(0.0047)	(0.0049)
PCB	-0.0001	-0.008	0.0008	-0.0001
	(0.0016)	(0.0119)	(0.0026)	(0.0119)
IND	0.0022			0.0019
	(0.0033)			(0.0108)
C	-0.161	-0.1531	-0.4154	-0.3199
	(0.5981)	(2.0225)	(0.7860)	(1.7366)
MAS		-0.0078		0.0015

		(0.0116)		(0.0259)
LTO			0.0044	0.0011
			(0.0065)	(0.0283)
Observations:	865	871	865	865
R-squared:	0.9562	0.9523	0.9556	0.9561
F-statistic:	NA	NA	NA	NA
Prob(F-stat):	NA	NA	NA	NA