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Effective financial inclusion and the need to put the horse before the cart: Saving!

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ABSTRACT

The financial inclusion paradigm is increasingly considered a veritable development model. Therefore, we argue that a deeper understanding of it is necessary for enabling policies and strategies that would yield positive development outcomes (successful financial inclusion). We explore this argument by first, defining "effective financial inclusion" along the lines of identifiable population groups that are often financially excluded from mainstream financial services; and second, by hypothesizing that large national savings pools are a crucial prerequisite for effective financial inclusion. Furthermore, we posit that if effective, financial inclusion should enhance economic welfare, thus engendering "successful financial inclusion." We evaluate these hypotheses by using a battery of econometric techniques, and document robust supportive findings. Moreover, we evolve first-of-its-kind robust definition of financial inclusion and provide unambiguous evidence that would guide governments and other stakeholders on how to leverage financial inclusion, as a development model, more productively. Importantly, we highlight the primacy of large savings pools for effective financial inclusion.

1. Introduction

Financial inclusion, which has become a popular development paradigm, has been defined in seemingly diverse ways by scholars (e.g., Helms, 2006; Demirgüç-Kunt & Klapper, 2012; Gwalani & Parkhi, 2013; and others), yet a common thread runs through these definitions. Specifically, *financial inclusion* entails the expansion of provisioning financial services or products in ways that explicitly consider particularly less well-off individuals/households, women, less educated individuals, rural dwellers, and small, micro, and medium size enterprises (SMMEs). Most of these groups of financial products consumers ordinarily would not have meaningful, if any, access to necessary financial services and products, especially in the context of vital financial products of mainstream (traditional) financial services firms. The articulation of this common thread across the different definitions of financial inclusion, appears to suggest a different and/or diverse set of preconditions vis-à-vis the preconditions for "financial deepening" (McKinnon, 1973; Shaw, 1973 and others), which we consider a "cousin" of financial inclusion.

There is a slight definitional difference, but a hugely significant difference in economic development emphasis and/or implications between "financial deepening" and "financial inclusion." Financial deepening involves expanding the savings pool for increasing investable funds for a set of traditional deficit-appropriating units – i.e., businesses, especially established ones, the few financial-included individuals/households, and governments. Whereas "financial inclusion" involves attempts to source a larger pool of investable funds additionally via often non-traditional, more risk-tolerant savings mobilizers to provision finance for welfare enhancement, primarily via consumption smoothing, and incremental production from less heralded sources of output generation – i.e., households and SMMEs.[1] A lack or absence of such delineation may result in erroneous claims of "financial inclusion;" or it

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[1] We view this important definitional difference to be akin to envisaging the same or similar kind of wine in either a new or old keg, where the essence of financial inclusion is the new keg and that of financial deepening is the old keg. We argue that the essential constituent elements of the two identifiable kegs are the same, with a bit more emphasis on a key "expansive" element (composition) – i.e., larger, and more varied sources of savings – for financial inclusion than for financial deepening. The gist here is that the savings pool that will foster the likelihood of, for example, extending credits to the "set of traditionally excluded financial services consumers" would have to be larger than it would have been otherwise. I.e., this larger pool would naturally include savings from both traditional/normal sources, as well as from non-traditional and/or novel sources (examples of which are provided in the next few paragraphs of this section).

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may even confuse "financial deepening" inferences for those of "financial inclusion". Alongside this important delineation, is the culmination of similarly relevant motivations that the literature heretofore has not addressed – the "how" of effective financial inclusion. For the first time in the financial economics literature, we identify two critical preconditions that would foster effective financial inclusion – i.e., coexistence of the source of the requisite financial resource (saving), and the tailor-made channel (non-traditional financial institutions, such as MFIs) for funneling the resource to the often-excluded groups.

Critically, the difference between financial inclusion and financial deepening is predicated on "financial inclusion" encompassing more diverse economic units with distinctively different credit profiles than those entailed by financial deepening.[2] We argue that strategies and policies geared towards leveraging "financial inclusion" (the cart) for unlocking more inclusive economic development, must consider the availability of a more substantial and varied sources of savings as a major prerequisite (the horse) (Dupas & Robinson, 2013; Hunte, 1997 and Kaboski et al., 2014). Specific key factors underpin our postulation. First, mainstream financial intermediaries use their pooled funds to provision financing principally for the few well-off individuals/households, and established firms (Beck et al., 2008; Denis & Mihov, 2003; Mishkin, 2004 and Ojah & Kodongo, 2015). This reality means that little or nothing remains for the majority poor individuals and households, and venturing micro to small enterprises, both sets of financial products consumers whose risk profiles place them outside the "comfort zone" of mainstream financial institutions. Second, on account of their better credit profile (e.g., investment grade rating), mainstream financial services institutions could, less strenuously, access savings via wholesale funds markets and even across borders to provision financing for established firms (Kodongo et al., 2015; Kodongo & Ojah, 2016; Obstfeld, 2009; Singh & Weisse, 1998).

Conversely, the kind of savings pool that is more amenable to high-risk borrowers often include a significant portion of savings mobilized through similarly high-risk tolerant and/or varied non-traditional sources, such as micro-finance institutions, revolving and rotating micro-saving schemes, venture capital funds, crowdfunds, donations and social-purpose oriented funds, and government credit support programs (Ashraf et al., 2010; Ojah & Mokoaleli-Mokoteli, 2010; Kaboski et al., 2014; Stanko & Henard, 2017; and others). Third, the model for provisioning finance by mainstream financial intermediaries is based primarily on borrowers' demonstrated predictable cash flows from which debts could be serviced. The additional group of economic units which "financial inclusion" particularly incorporates, typically lacks the capacity to ensure predictable cash flow patterns; therefore, savings sources characterized by less stringent debt servicing demand (and/or also characterized by creative collateral substitutes), are necessary for these additional kinds of potential borrowers.

As is apparent from the foregoing, there is a distinct profile of the additional sets of financial product consumers and, implicitly, different sets of attendant financial products entailed by the financial inclusion paradigm. Consequently, these important questions arise: (1) Are large domestic pools of savings (which logically subsumes more diverse sources of saving) indeed a key prerequisite for sustainable (effective) financial inclusion, and, thus, yield what we term "effective financial inclusion"? (2) Does the channeling of the pooled large savings to deficit units through the more risk-tolerant non-traditional financial intermediaries (e.g., microfinance banks and venture capital funds) work better in fostering effective financial inclusion? (3) Given the peculiar nature of the two key groups of target financial products consumers implicit in the financial inclusion paradigm (i.e., less well-off individuals and households, who primarily seek financial products to enhance welfare by consumption smoothing, and SMMEs that seek capital finance mainly outside the ambit of mainstream financial institutions in order to initiate or expand production), what factors, in conjunction with a large savings pool and non-traditional financial intermediation, are likely to enable "successful financial inclusion" (enhanced welfare outcomes of effective financial inclusion)? In other words, what factors enable "effective financial inclusion" to elicit the associated or sought-after economic growth and development?

To contextualize these empirical questions, we start by further clarifying the key definitions in this work. First, "effective financial inclusion" (EFI) entails the conception of financial inclusion from the perspective of recognizing the often-excluded population groups, alongside mechanisms by which these groups can be enabled to access financial services and products. This EFI definition is distinct from the effectiveness connoted by a larger savings pools' enhancement of EFI. However, in the broader context of our work, we view the coexistence of larger savings pool and EFI, as here defined, as making financial inclusion more effective as a veritable economic development model. Second, there is need to clarify what we mean by "successful financial inclusion" as well as highlight what factors might be useful in enhancing the role of savings in facilitating successful financial inclusion.[3] Successful financial inclusion naturally implies a positive impact of financial inclusion initiatives or policies on the welfare of the groups of the usually financially excluded.

Many studies, some of which deployed field experiments, find that increased access to finance among excluded individual/household groups experience improved: consumption patterns, healthcare access, school enrollment, agriculture output, self-employment, as well as reduced overall poverty (Jensen, 2000; Bruhn & Love, 2009; Ashraf et al., 2010; Dupas & Robinson, 2013; Kaboski et al., 2014 and others). Similarly, studies which focused on SMMEs, find that SMMEs experience improved longevity (e.g., high start-ups' survival rate), and increased productivity and profitability, all of which, in turn, also manifest in higher output and employment, and reduced inequality and poverty at the macroeconomic level (Ardic et al., 2011; Beck & Demirguc-Kunt, 2006; Cull et al., 2013; De Koker & Jentzsch, 2005; Dittus & Klein, 2011; Winter-Nelson & Temu, 2005). Considering the level of hope that countries and development agencies appear to have placed on the prospects of unleashing growth and development via the "financial inclusion" paradigm (Mushtaq & Bruneau, 2019; Chakrabarty & Mukherjee, 2021; Kamau & Ojah, 2023; and Karuitha, 2023), it is

[2] In support of our supposition, we recall aspects of the essence of financial intermediation: (a) To intermediate the mismatch between preferred maturity of financial contracts by surplus saving units (SSUs) and the preferred maturity by deficit saving units (DSUs), (b) to intermediate differences in the denominations of SSUs' lending contracts and those of DSUs' borrowing contracts, and (c) importantly, to intermediate the differences in overall risk tolerance between various groups of SSUs and DSUs – e.g., matching the risk appetites/profiles of savers/fund providers and borrowers/fund users for ventures, as in, for example, angel (venture capital) finance for financing hi-tech or innovation start-ups (see Allen & Santomero, 2001; Ojah & Mokoaleli-Mokoteli, 2010; Mazzucato & Penna, 2015; Ojah & Kodongo, 2015; and others).

[3] The idea here, in summary, reflects the phenomenon we broadly consider financial inclusion effectiveness in this paper. A steady supply of requisite production input for non-mainstream financial services institutions, which have emerged primarily to push the financial inclusion paradigm – characterized by larger and/or more diverse pool of savings – fits this "effective financial inclusion" narrative, which subsumes both the more reflective constructs of the "needs to be included groups" and the necessity of reasonable supply of a key production input to the relevant financial institutions. Arguably, MFIs are the epitome of the relevant financial institutions for this narrative (Kamau & Ojah, 2023), and they (the MFIs) can, in turn, take the form of one of two broadly defined legal business forms (models): (1) Non-governmental organization (NGO) business model or (2) Profit-oriented (commercial) business model; and at the heart of these business models' distinction is the issue of sustainability of MFIs, which is determined by the availability of a requisite production input – i.e., savings (D'Espallier et al., 2017; Karuitha, 2023 and Mersland & Strom, 2010).

important to examine more comprehensively factors through which "effective financial inclusion" facilitate "successful financial inclusion" (enhanced welfare). Our examination of nuanced effects of financial inclusion on disparate target beneficiary-groups, a major interest of our study, would aid a more effective structuring of financial inclusion policies and strategies by firms, non-government organizations, and especially development agencies and governments. For instance, we have highlighted workable boundaries of the financially excluded; furthermore, a premature regulation of new financial institutions or market innovations (fintech)[4] can stifle such markets' establishment or abort their growth.[5]

Additionally, there is almost an empirical regularity that financial markets are complementary, with banks at times shown to be necessary for fostering expansion of investor base for initiating and growing public debt (i.e., bond) market and, thus, support smooth functioning of stock markets by providing listed firms with working capital (Ladekarl & Zervos, 2004; Naceur et al., 2007; Ojah & Kodongo, 2015). The extent to which a significant suite of various financial markets and their accompanying infrastructures (financial development) exists in a country, influences the likelihood that such an elevated level of financial development will encourage and/or support financial product and market innovation. The government or interested organizations can, in turn, leverage this "fertile soil" to enable financial inclusion in the country.[6]

To note briefly, we document results that support our hypothesis that, indeed, a large savings pool is the necessary "horse" to pull the "cart" (financial inclusion). In other words, where the sought-after "effective financial inclusion" and its attendant welfare enhancement obtain, there is a significant evidence/presence of larger pools of savings, among other factors. More specifically, and within extant literature, we contextualize the findings of our paper as follows. First, in our mission to flag the necessity of sustainability/effectiveness of the "financial inclusion" that can be achieved by understanding the need to first provide its key antecedent (i.e., large saving pool), we, for the first time, define a set of "financial inclusion" constructs that directly captures or reflects the inclusion of specific groups that the literature has variously identified as being financially excluded – e.g., the unemployed, much of the female population, the poor, and the rural dwellers in our sample countries.

Second, we specifically examine factors that could foster "effective financial inclusion," such as availability or extent of non-traditional financial intermediaries and/or services provisioning forms. Third, we further show that if "effective financial inclusion" indeed exists in the manner we have defined it, then that effectiveness would be reflected by way of enhanced economic welfare effects of the "effective financial inclusion." Such an outcome would, in turn, be deemed "successful financial inclusion." And we, indeed, document findings that are consistent with this outcome, where, for example, we show that a 10 % increase in "effective financial inclusion" would lead to 2.5 % increase in secondary school enrollment and a 0.16 % decline in the proportion of the population that is undernourished. Fourth and finally, a summative take-away is a clear and systematic policy guide on how governments interested in economic development can effectively leverage the financial inclusion paradigm. That is, by understanding fully the target population that the development paradigm seeks to uplift, the major drivers of the paradigm (coexistence of large savings pool and non-traditional financial institutions), and how to assess its eventual success.

The remainder of the paper proceeds as follows. Section 2 presents the theoretical underpinning, the conceptual framework, and a formal statement of the hypotheses tested in the paper; Section 3 presents the methodology and describes the variables and data used in the study; Section 4 presents the empirical evidence on the key issues engaged by the paper (the nexus between aggregate savings and financial inclusion – i.e., evidence on effective financial inclusion), and discusses all other findings and their implications for developing countries; Section 5 further tests the validity of our "effective financial inclusion" constructs by presenting evidence on linkages between it (effective financial inclusion) and welfare – i.e., evidence on successful financial inclusion; and Section 6 concludes.

2. Theoretical and conceptual underpinnings

2.1. Theoretical framework

We derive the foregoing motivation for this work from a confluence of two well-traversed financial economics theories – i.e., access to finance and finance—growth nexus. Arguably, the access to finance hypothesis has three logical undergirds. (1) Fundamental among these three is the availability of a pool of investible funds (savings) from which potential deficit saving units could partake (access finance) (e.g., Jappelli & Pagano, 1994; Bouman, 1995; Hunte, 1997; Rutherford, 1998; Cesaratto, 1999; Ashraf et al., 2010; Kaboski et al., 2014). (2) Deficit saving units have compelling reasons for seeking additional (external) finance beyond their currently available (internal) resources – whether these reasons be about production or consumption (Butler & Cornaggia, 2011; Dupas & Robinson, 2013; Mazzucato & Penna, 2015). (3) Moreover, for accessibility to materialize, certain preconditions, such as credit history, collateralizable assets, and discernable future cash flows, are expected and/or demanded of deficit saving units by funds providers (surplus saving units) (Das, 2016; Denis & Mihov, 2003; Grohmann et al., 2018).

Clearly, the cumulation of unconsumed incomes and other forms of capital accumulation – i.e., savings – are the fundamental basis upon which the postulation of "access to finance" rests, as well as it justifies our supposition of the primacy of large savings pool for "effective financial inclusion." Unravelling undergirds (2) and (3) above, highlights the "how" and "why" most individuals and informationally opaque micro-small ventures are excluded from financing consideration by mainstream financial services institutions and markets – e.g., difficulty in justifying the economic importance of various forms of household consumption, absence of credit history and/or marketable collateral, dearth of reliable relevant information on pre- and/or post-contract behavior of potential borrowers, and so on. Interestingly, attempts to resolve these impediments to accessing finance, particularly those financial services and products provided by mainstream financial institutions, birthed microfinance institutions and the attendant financial inclusion paradigm (Helms, 2006; Hulme & Moore, 2006; Hamada, 2010; and others). Moreover, the successful intervention of finance at resolving the financing wedge faced by deficit saving units of diverse

[4] Fintech is a label used to describe products, product developers, and operators of alternative financial products or systems (Narain, 2016). They characteristically depend on digitalization which is often expressed on or via the ICT platform.

[5] Where this undesirable outcome is likely, governments are better advised to follow the "regulatory sandbox" approach where, for example, a fintech product/institution is allowed to grow unregulated for a period of time, with this unfettered period of operation allowing the product/market to get reasonably rooted and for regulators to understand how the product/market works (areas of vulnerability, who needs to be protected, etc.), before rolling out appropriate regulation (and supervisory schemes) to ensure prudential existence of the product/market (Narain, 2016; Ndung'u et al., 2016).

[6] It is particularly more difficult for micro to small financial intermediaries (a characteristic of most MFIs) to create credits without a matching or close-to-commensurate savings pool (e.g., deposits), unlike large banks which can generate a significant additional amount of credit beyond their deposits by writing loans against borrowed (or bought) funds. That is, they can source production inputs easily in the funds market – e.g., via commercial papers, securitization of illiquid debt contracts, issuance of subordinated debts, and so on (Werner, 2014; Mazzucato, 2019; and others).

kinds, flags the essence of "access to finance," the advancing of economic growth, and particularly points to the claim and/or expectation of the finance—growth nexus.

In the finance—growth theory, the gist of the argument is that finance is correlated to economic growth, if not, a cause of growth (Schumpeter, 1911; McKinnon, 1973; King & Levine, 1993a, 1993b; Rajan & Zingales, 1998; Levine, 2005; and Ojah & Kodongo, 2015). In a remarkable piece of work, Rajan and Zingales (1998) provide, in our view, what is hitherto one of the most convincing data-supported expositions of how finance enables economic growth – i.e., by evolving a financing model that identifies and resolves the financing wedge against the harnessing of potentially attractive production projects. Specifically, Rajan and Zingales show that firms in industries that are highly external finance dependent would achieve higher economic growth where external finance is more available than firms in less external finance dependent industries. Furthermore, both kinds of firms experience higher economic growth in countries providing a higher supply of finance vis-à-vis those in countries providing a lower supply of finance. Naturally, and consistent with our arguments in this paper, the evidence suggests that a higher supply of finance is strongly correlated with a larger pool of savings (Gupta, 1987; Jappelli & Pagano, 1994; Kaboski et al., 2014; Rutherford, 1998 and Singh, 2010).

In Rajan and Zingales' (1998) model, not only is availability of finance crucial, the ability of firms to access this finance is equally vital – i.e., characteristics of firms that would facilitate accessing of finance, play a role in completing the virtuous flow from finance (savings) to economic growth (Beck & Demirguc-Kunt, 2006; Honohan, 2008; Butler & Cornaggia, 2011; Gwatidzo & Ojah, 2014; and others). Therefore, access to finance is crucial in determining the extent to which finance fosters growth. In fact, the form (nature) of access to finance (i.e., external finance provisioning) subsumed within the Rajan and Zingales' (1998) model is what we argue (Section 1) is akin to "financial deepening" (also see Fry, 1978, 1980; and Ghosh & Vinod, 2017). In other words, the external finance provisioning entailed by "financial deepening" caters mainly to established firms. Consequently, a critical question we engage with in our theoretical conception of finance-enabled welfare enhancement for most individuals, households and micro to small enterprises is, what is the nature of access to external finance that would enable these groups of traditionally financial excluded consumers to address the financing wedge they encounter in their various primary forms of economic activity? (Ardic et al., 2011; Helms, 2006; Inoue & Hamori, 2013 and Winter-Nelson & Temu, 2005). In this question lies a summary fulcrum of this paper – the potential productive intervention of the financial inclusion paradigm at both mobilizing additional savings (finance) and enhancing the welfare of formerly excluded groups.

In other words, by extrapolating equivalent economic narrative like the kind inspired by Rajan and Zingales' (1998) 'established firms'-based insights to the identifiable groups of 'financially excluded', we raise a couple of questions, which when answered systematically undergird the argument of this paper, as well as yield the testable empirical hypotheses we laid out in the introduction section: 1) which individuals/households are external finance dependent and why? 2) What kinds of products and services offered by financial institutions and markets are amenable to addressing the specific kinds of financing wedge that confront most individuals and households and, thus, tend to inhibit their attainment of finance-enabled welfare enhancement? Interestingly, financial products, platforms and policy initiatives that facilitate the financial inclusion associated improvements of the identified target groups (categories of individuals and households that are more exposed to financial exclusion), are distinct from products, platforms and policies that focus on leveraging finance to support the needs of established businesses and government units (i.e., those geared towards fostering financial deepening).[7] Microfinance institutions (MFIs) such as microbanks, micro-savings firms, micro-insurance and other expansive financial intermediation mechanisms, such as decentralized finance (DeFi) and blended finance technologies,[8] are principally designed to reach groups that are traditionally not accommodated by mainstream financial services firms such as commercial banks, savings & loan associations, and insurance companies (Cohen & Sebstad, 2005; Gwalani & Parkhi, 2013; Helms, 2006; Mersland & Strom, 2010).

Focusing on the groups of the 'traditional financially excluded' that are empirically investigated in this paper,[9] we highlight scenarios at the individual/household level that are analogous to Rajan and Zingales' (1998) external finance wedge which firms contend with whilst seeking growth-enhancing production. For example, a poor household headed by a barber, or a taxi driver characteristically faces an uncertain and variable incomes pattern. Yet, the household's feeding, housing, and schooling expenditures are fixed. During periods of mismatch between incomes and expenditures, resulting deficits could be plugged by past unconsumed incomes (a near impossibility if there is no access to a robust saving facility) or by access to a bank credit line. Should such a household reside in countries, such as Bangladesh, Uganda, or Venezuela, where mainstream financial services firms neither encourage thrifting nor provide credit to households with no traditional (marketable) collateral or credit history, only a different financial services model can save the day. Microfinance institutions are often set up to mitigate such exclusionary financial services hurdles (Ashraf et al., 2010; Berger & Nakata, 2013; Bouman, 1995; Chakrabarty & Mukherjee, 2021 and Cohen & Sebstad, 2005). A similar analogy can be mapped for an individual/household that is a subsistent farmer resident in a rural area, or a female-headed household with a 'cottage industry' based job (self-employment). In other words, there are a multitude of ways that the financially excluded groups of individuals/households are external finance dependent.

Interestingly, platforms and/or mechanisms such as ICT, big-data technology, a culture of product innovation, effective regulation (legal environment), high financial development, among others, have been pointed out as factors that might enable developing countries to overcome physical-infrastructure-heavy mainstream financial institutions' limited reach, in order to provide financial services to formerly excluded consumers, especially women and young adults resident in rural and pseudo-urban areas (Mbiti & Weil, 2011; Jack & Suri, 2011; Allen et al.,

[7] Fairly distinct from those underlying the "financial inclusion" paradigm, the main platform and/or mechanism used to effect "financial deepening" manifests via financial liberalization policies and/or financial system reforms, often reflective of the famous McKinnon-Shaw hypothesis. Moreover, these policies or reforms are usually entirely initiated and managed from the macroeconomic policy perch (McKinnon, 1973; Shaw, 1977; Fry, 1978; Gibson & Tsakalotos, 1994; Shahin, 1996 and many others). Those for enabling financial inclusion, appear to be characterized by product and market innovations that are driven by disruptive financial services (business) models, with governments compelled to follow suit, by way of regulatory or subsidy support (Barua et al., 2016; Gwalani & Parkhi, 2013; Mohan, 2006).

[8] DeFi and blended finance models require a bit of elucidation here. DeFi, as a part of the Fintech ecosystem, deploys the blockchain distributed ledger system to decentralize financial services by diminishing the importance of financial intermediaries but instead fosters a peer-to-peer network of financing (Schueffel, 2021; Zetzsche et al., 2020). Interestingly, it enhances access to finance via both mainstream and non-traditional financial institutions Blended finance, on the other hand, is a broad concept of innovative financing mechanisms that encompass both public and private finance for developmental purposes (Soumonni & Ojah, 2022; UNDP, 2012).

[9] Though our theoretical argument for the essence of financial inclusion speaks to identifiable groups that are often excluded by mainstream financial services institutions – i.e., most of national populations' individuals and households found in rural dwellings, among the female folk, the unemployed, the quite poor; and micro-small ventures – our empirical analysis in this paper focuses on the former group – i.e., the individuals/households group.

2014; Narain, 2016; Das, 2016).

2.2. Conceptual model and hypotheses

The key empirical question that this paper explores is whether a larger pool of aggregate savings plays the vital role of fostering effective and successful financial inclusion. Besides it being unarguable that pulling together investable funds (savings) would increase funds availability and, thus, facilitate access to finance, our key empirical question here is informed, in part, by the set of literature, which has, first, identified savings as a possible enabler of economic growth (e.g. Cesaratto, 1999); second, illuminated the relative difficulty non-traditional, more risk-tolerant financial intermediaries face in expanding credit beyond their deposits pool (e.g., see Karuitha, 2023, and footnote 6); and third, identified savings as a facilitator of entrepreneurial and microenterprise development, especially in low-income countries (e.g., Dupas & Robinson, 2013; McCormick & Wahba, 2001). This third strand of the literature is more closely aligned to our position that a larger savings pool could be the catalyst that financial inclusion efforts need to be more effective at expanding the set of economic opportunities available to low-income individuals. Yet, as pointed out, the literature has neglected the potential direct link between savings and financial inclusion efforts, which is necessary for there to be "effective financial inclusion" and its associated welfare-enhancing effects ("successful financial inclusion").

In many developing countries, the stock of savings can be more effectively channeled to hitherto excluded economic units (or segments of a country's population) via financial institutions that deploy appropriate financial inclusion models, such as micro to small contract denominations and group lending arrangements (Al-Azzam, Hill & Sarangiour, 2011; Kodongo & Kendi, 2013).[10] Such non-traditional financial intermediaries include microfinance banks (Banna et al., 2022), micro-credit institutions (Leite et al., 2024), and savings and credit co-operative societies (Schoofs, 2022). Thus, a combination of higher aggregate savings and greater presence of non-traditional financial intermediaries should potentially boost the effectiveness of financial inclusion initiatives. We integrate these insights and linkages in Fig. 1 to present the unified framework that articulates our conception of "effective financial inclusion," as well as guides us to outline the paper's testable hypotheses.

The figure indicates that high aggregate savings in an economy are associated with moderate to high effective financial inclusion, whilst low aggregate savings would produce low effective financial inclusion. The figure also shows that high aggregate savings would be more effective at fostering financial inclusion if in addition to the basic presence of mainstream financial institutions, a relatively large proportion of the savings are channeled to economic agents appropriating deficits (loanable funds) through non-traditional financial intermediaries such as microfinance banks and micro-credit institutions (i.e., MFIs). Conversely, a combination of a relatively low prevalence of non-traditional financial intermediaries and low aggregate savings, in addition to the basic presence of mainstream financial institutions, would be a recipe for low effective financial inclusion.

The natural consequence of these postulations is captured by the following statement.

A large aggregate savings pool, a relatively substantial portion of which is intermediated by non-traditional, more risk-tolerant financial intermediaries, yields high and/or positively impact effective financial inclusion.

Based on these conceptual conjectures, we specify our set of testable hypotheses as follows:

Hypothesis 1. Aggregate savings in an economy is positively related to financial inclusion (effective financial inclusion).

Hypothesis 2. Prevalence of non-traditional financial institutions in an economy is positively associated with financial inclusion (effective financial inclusion).

In our formal tests of these hypotheses, we also include an interaction term to establish whether a more nuanced relationship exists, in which the presence of non-traditional financial intermediaries might moderate the relationship between financial inclusion and aggregate savings; and thus, yield what we deem high or strong effective financial inclusion. Per our definition of financial inclusion in the introduction section, "financial inclusion entails extension of financial services provisioning in ways that explicitly target groups that are often excluded from consumption of financial services and products." If this inclusion effort is indeed effective, how does one ascertain such an outcome? Having highlighted in our theoretical argument that finance and welfare are correlated at both firm and household levels (Ashraf et al., 2010; Chakrabarty & Mukherjee, 2021 and Rajan & Zingales, 1998), we hypothesize that successful "effective financial inclusion" would positively impact the welfare of the group targeted by the financial inclusion initiative. This is the paper's third hypothesis:

Hypothesis 3. Effective financial inclusion is positively related to economic well-being of traditionally financial excluded segments of society (successful financial inclusion).

3. Data and measurement

3.1. Data collection

The financial inclusion data used in this study are from the World Bank's Financial Inclusion (Global Findex) database. The data were gathered by Gallup Inc., through a survey, using randomly selected, nationally representative samples of about 1000 per country.[11] The survey employed telephone interviews in the first instance; however, in countries where telephone coverage was less than 80 % of the population, face-to-face interviews were employed. The criteria for building the sampling frame were country-dependent and were guided by availability of data. Where population data were available, samples were selected based on probabilities proportional to population size; in such cases, the sampling units were stratified by population size, and/or geography and a multistage clustering sampling approach was subsequently deployed. Where there was paucity of population information, on the other hand, a simple random sampling procedure was followed.

Households were picked randomly for the interviews; and respondents, aged 15 years or older, were picked randomly from among members of the sampled households. Up to three attempts were made to contact initially unavailable sampled respondent/household at different times of the day; however, a random replacement would be made if the attempts did not yield success. Whenever possible, self-administered questionnaires would be adopted, in which case the Kish grid was used to select respondents. For telephone interviews, the pollsters used random digit dialing or chose randomly from a national list of telephone numbers if available. To address possible sampling and nonresponse errors, and selection bias, base sampling and post-stratification weighting schemes were applied on the collected data. The final dataset posted on the World Bank Findex database captures aggregate information: for example, the proportion of the national population with

[10] Kodongo and Kendi (2013) find that group lending is better able to mitigate loan default than personal lending by microfinance institutions in Kenya; Al-Azzam, Hill and Sarangiour (2012) find that peer monitoring, group pressure, and social ties reduce loan delinquency in Jordan. Therefore, microfinance institutions which are more adept at group lending (compared to commercial banks), would stand a better chance of effectuating financial inclusion.

[11] A detailed description of the methodology of the Gallup Poll can be found on the Gallup website.

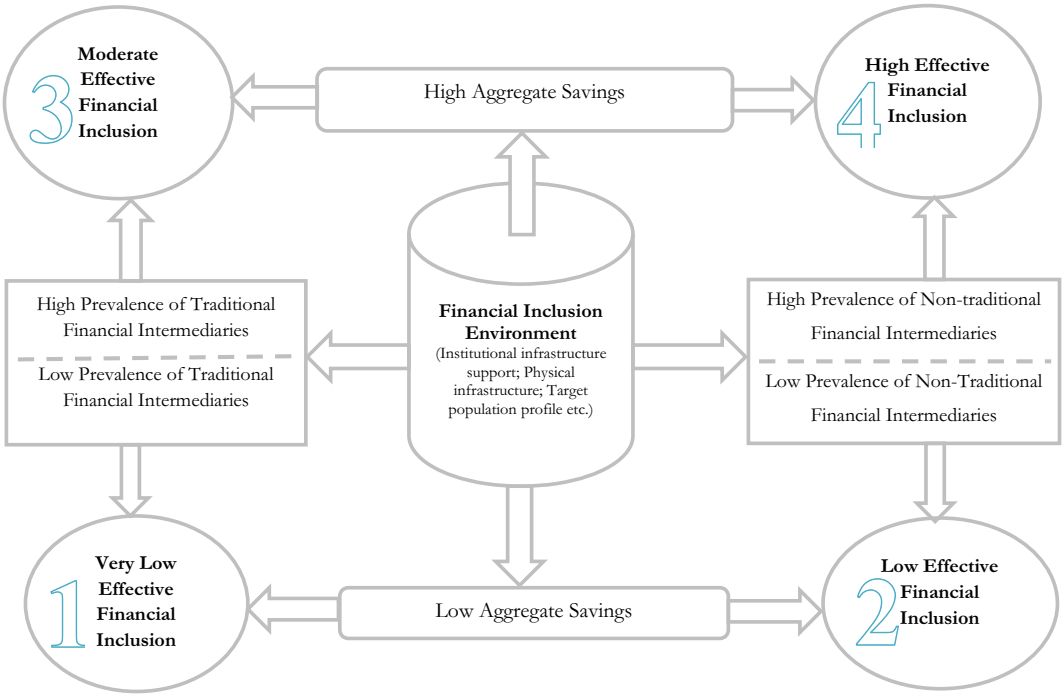

Fig. 1. Aggregate savings, financial intermediaries, and effective financial inclusion.

an account at a financial institution. The rest of the data is from the World Bank's World Development Indicators database. The World Bank collates the data from various national Statistics Offices worldwide and then takes them through a standardization process[12] to achieve acceptable levels of consistency, reliability, and comparability. For converting data to US dollars, the World Bank uses its familiar Atlas conversion factor, which averages the country's exchange rate for the relevant year and the exchange rates for the two preceding years, accounting for the difference between the country's rate of inflation and the international inflation rate.

All the data are obtained from their sources at the macro-level (i.e., in aggregated form). For our baseline analysis, we employ a pseudo-panel (repeated cross-sections) of ninety countries, sampled from developing countries covered by the Global Findex Survey, covering three survey cycles: 2014, 2017, and 2021. The database includes a total of four survey cycles conducted and published approximately every three years since 2011. However, the earliest survey, reported in 2011, does not carry the full list of variables that we have employed to develop the effective financial inclusion construct and is therefore excluded from this study. The 2021 survey represents data that were gathered during the covid-19 period and had fewer countries reporting than those reporting for the previous two cycles. Because we needed a balanced "panel" to run some of the tests, we sampled 90 countries with as complete as possible Findex data for all the three cycles. The list of all countries used in analyses carried out in this paper is presented in Table A1 of the Appendix.

The panel approach offers us not only an increase in the degrees of freedom for our analyses but also allows us to control country-specific unobserved developments. In our robustness checks, reported in Section 5.2, we analyze a cross-section of 96 countries gathered from the 2017 survey cycle, the year with the largest number of reporting countries and list of financial inclusion variables. The choice and measurement of the variables and proxies that we used in this paper follows. The paper is in two major parts. The first part enables us to answer the question of whether aggregate savings plays a key role in fostering effective financial inclusion, as well as gives us useful insights into the nature of the contribution of the various groupings of enabling factors in advancing effective financial inclusion. We address, in the second part, insights on the question of the attendant welfare enhancement impact of "effective financial inclusion" (i.e., successful financial inclusion).

3.2. Variables and measurement

Whilst relevant financial institutions work through channels such as credit type (e.g., group lending), credit terms (e.g., loan period, repayment plans, interest rates), collateral type or form (usually peer monitoring and group dynamics without tangible secondary-market-traded collaterals), and even loan size, the presence of enabling conditions could further mediate financial inclusion effectiveness: for instance, financial markets' depth, liquidity and efficiency (Allen et al., 2016; Mohan, 2006); use or adoption of appropriate technology such as functional and safe ICT platforms (Berger & Nakata, 2013; Diniz et al., 2012), and enabling institutions and regulation (Kodongo, 2018), are variables that the literature has found important in this regard. Accordingly, a pertinent line of questioning follows the recognition of the possible effects of these environmental issues/factors: which of these enabling conditions or support factors is/are most impactful in enhancing the effectiveness of financial inclusion efforts? For this study, we group the support factors (enabling conditions) into three broad categories of variables, the constituents of which are described in this section:

a. Institutional infrastructure support: e.g., legal environment, effective governance, high quality regulation, financial market liquidity (financial development), etc.
b. Physical infrastructure support: e.g., fixed telephone subscriptions, mobile phone penetration, etc.
c. Target population profile: e.g., transactional usage of financial institutions, such as for: receiving wages, receiving remittances, receiving government transfers, etc.

In the following paragraphs, we present definitions/descriptions of,

[12] Details of the World Bank's standardization methodology are available on various World Bank's websites.

and justify the key variables used in this paper, starting with a major innovation of the paper – "effective financial inclusion."

3.2.1. Effective financial inclusion

Financial inclusion is generally understood to be multifaceted (Ahamed & Mallick, 2019; Kebede et al., 2021). Thus, since Sarma and Pais (2011) proposed one of the first comprehensive indexes, many studies have attempted to develop constructs that can capture all its dimensions, or the most important ones, in one metric (Ahamed & Mallick, 2019; Kebede et al., 2021; Pesqué-Cela et al., 2021). In many of these studies, financial inclusion is defined to include three dimensions, namely, availability (access), penetration, and usage, with each proxied by different metrics depending on the context of the study. In the more recent study, Tram et al. (2023) adds a fourth dimension to the availability-penetration-usage class of sub-constructs – mobile money – and develop an index with weights derived from principal components analysis. However, such constructs are not without shortcomings. For example, using confirmatory factor analysis, Pesqué-Cela et al. (2021) find a strong positive correlation between the access dimension and the usage dimension, indicating that some of the constructs do not adequately capture the multidimensionality of financial inclusion; they also point out that many of the financial inclusion indexes in use tend to be biased towards supply side metrics.

Demirgüç-Kunt and Klapper (2012) observe that the "challenge of financial inclusion primarily affects women in poor households, people living in rural areas, or individuals out of the workforce", whilst Ghosh and Vinod (2017) find that female-headed homes were 8 % less likely to access financial services than households headed by males. Despite these findings, which suggest that special attention should be paid to such individuals, Pesqué-Cela et al. (2021) have documented a systematic neglect or underrepresentation, by researchers, of such groups of potential consumers of financial services when constructing financial inclusion indexes. To address some of these limitations, namely, overreliance on supply-side metrics and neglect of some categories of consumers that have been traditionally excluded from financial services, we develop a financial inclusion construct that employs demand-side information and focuses on the categories of consumers that have been traditionally excluded. Specifically, our index of effective financial inclusion is constructed as a weighted average of the proportion of individuals out of the labor force, females, individuals in the lowest 40 % of the income bracket, and rural dwellers, all aged 15 years or more, who: (1) had an account; (2) used the internet to pay bills or to buy something online; (3) saved at a financial institution; (4) borrowed from a financial institution; and (5) made or received digital payments, in the last one year.

The first indicator (had an account) captures the proportion of the categories of individuals of interest who have an account at a formal financial institution such as a bank, credit union, microfinance institution, post office, or a cooperative. The importance of owning a formal account is that it creates a safe platform for savings and capital accumulation, opens opportunities for credit receipt for starting a business and/or for financing essential social services such as education, and is an efficient conduit for receiving and making payments and remittances from or to family, employers and government (Demirgüç-Kunt & Klapper, 2012). For these reasons, account ownership is often seen as signalling the readiness and/or likelihood of individuals to use financial services. The remaining indicators measure actual recent and/or current usage of basic financial services (saved at a financial institution; borrowed from a financial institution) or relatively sophisticated financial services (used internet to pay bills or buy something online; made or received digital payments). Given the recent proliferation of digital financial services (fintech) globally (Al Suwaidi & Mertzanis, 2024), the latter categories of usage enable us to capture individuals' consumption of formal financial services in the more contemporary digital format (Tram et al., 2023) whether through mainstream prudential-driven financial intermediaries such as banks or emerging less regulated ones such as fintech startups.

We obtain data on these variables from Global Findex. Using these variables, we construct a synthetic sub-index of (effective) financial inclusion (EFI) for each of the four categories of individuals who most researchers have documented to be more exposed to financial exclusion. Since the variables constituting each of the dimensions are highly correlated, we derive the weights, w, for the sub-indexes (j) through the principal component analysis (PCA) procedure, such that the weight of each variable (w) is the variable's corresponding factor score from the first principal component. The first principal component is the single linear combination of the financial inclusion indicators that explains the largest proportion of variations in those indicators. For the 2017 series, for example, the first principal component (PC) explains between 66.6 % of total variation (for individuals out of labor force) to 71.4 % of total variation (for rural dwellers). The second PCs consistently explain less than 20 % of total variation. Further, the first PC consistently have eigenvalues exceeding 3.30 while all the other PCs have eigenvalues below 1.00. Eq. (1) describes the mathematical relationship.

$$SubIndex_j = \sum_{k=1}^{m} w_{j,k}^{PC1} \times y_{j,k}, j = 1, \ldots, 4; m = 5 \tag{1}$$

where $y_{j,k}$ is the value of the constituent variable, k, of financial inclusion sub-index, j; $w_{j,k}^{PC1}$ is the principal component analysis-derived factor scores corresponding to constituent variable, k, of sub-index, j; and m is the number of constituent variables in the sub-index j. To illustrate, the "out of labor force" sub-index ($SubIndex_{OLF}$) is constructed as, $SubIndex_{OLF} = 0.5146acc_{OLF} + 0.4582int_{OLF} + 0.4695sav_{OLF} + 0.2055bor_{OLF} + 0.5124digp_{OLF}$, where the variables, acc_{OLF}, int_{OLF}, sav_{OLF}, bor_{OLF}, and $digp_{OLF}$ respectively, represent the proportion of the population out of labor force that (i) had an account, (ii) used the internet to pay bills or to buy something online; (iii) saved at a financial institution; (iv) borrowed from a financial institution; and (v) made or received digital payments in the last one year; the accompanying numerals are the respective factor score coefficients. The resulting sub-indexes correlate highly with the original variables; thus, demonstrating that the procedure results in a good representation of the original series. Fig. 2 (panels A through E) illustrates the soundness of the resulting synthetic constructs using the "out of labor force" sub-index. The index of effective financial inclusion (EFI) is constructed as the geometric average of the four sub-indexes as shown in Eq. (2):

$$Index\ of\ EFI = \left[\prod_{j=1}^{n}\left(1 + SubIndex_j\right)\right]^{1/n} - 1 \tag{2}$$

where n is the number of sub-indexes included (which equals 4 for the main overall index, and 6 for the alternative overall index used for robustness checks). Like the sub-indexes, the index of EFI is very representative of its constituents as the correlation matrix in Table 1 demonstrates.

Given their construction from similar individual-level variables, the sub-indexes generally contain overlapping information. We attempt to address this at the time of their construction by deriving endogenous weights using principal component analysis. Further, in our empirical tests, additional to using the overall index (EFI), we also adopt a differentiated treatment in which we run similar tests with each subindex. Consequently, the overall index and its sub-indexes serve as our dependent variables, and we used them alternately when estimating Eq. (4). As indicated, we also construct, for robustness checks, a broader overall index, "Effective Financial Inclusion Index – Alternate" (Alt-EFI), which includes the four dimensions captured in the baseline overall index (EFI), plus "individuals with primary school education or less", and "young adults", both of whom are also traditionally regarded as likely to be excluded from accessing financial services. Panel F of Fig. 2 documents a strong correlation between the main index and the

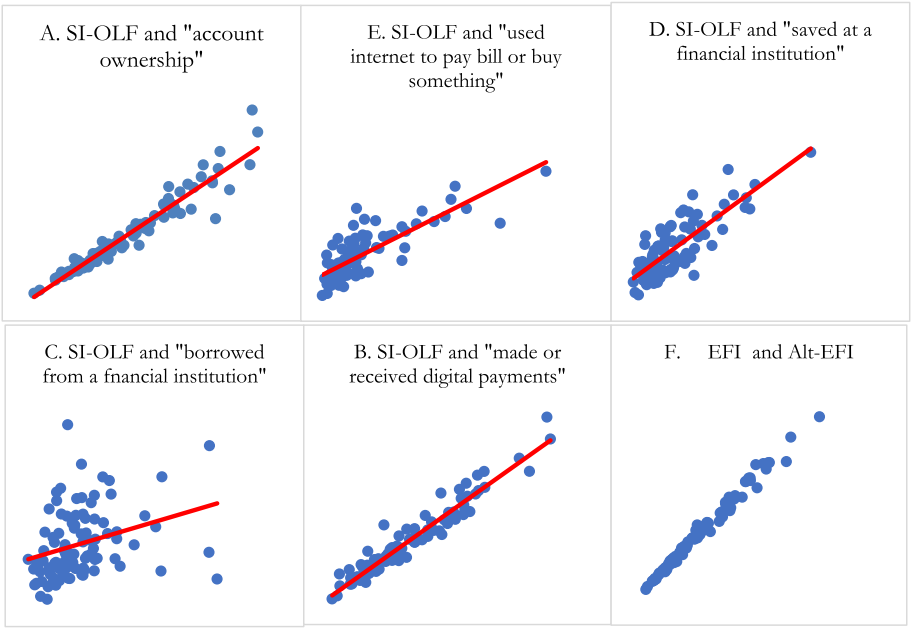

Fig. 2. Correlation between "out of labor force" sub-index (SI-OLF) and constituent variables, 2017.

Table 1
Correlations between sub-indexes and indexes of financial inclusion, 2017.

Dimension/Sub-index	Correlation with	
	Effective financial inclusion index (EFI)	Effective financial inclusion index – Alternate (Alt-EFI)
Population out of labor force	0.983	0.979
Females	0.968	0.979
Poorest 40% of population	0.961	0.980
Rural dwellers	0.948	0.982
Young adults	0.909	0.949
Primary school education	0.897	0.939

alternate index.

This figure shows the scatter graph for and each of its five constituent variables, with the line of best fit.

3.2.2. *Effective financial inclusion performance of countries and regions*

Table 2 presents the 2017 performance of countries based on the effective financial inclusion index and its constituents (sub-indices). We highlight the best 10 (Panel A) and bottom 10 (Panel B) countries, alongside their geo-political regions. The top 10 positions are dominated by countries in East Asia and the Pacific (EAP) (4 out of 10 countries), with Europe & Central Asia (ECA) and Middle East & North Africa (MENA) being the only other represented regions. The bottom 10 countries list is dominated by countries in the Sub-Saharan Africa (SSA) region. It is also useful to appreciate the performance of the six developing regions from which the countries are drawn. Panel C provides the ranking by the regional mean. Consistent with the "picture" presented by the best 10 countries, EAP leads the developing regions in effective financial inclusion. However, EAP, like MENA (which is ranked third by the average), also reports a high standard deviation, indicating high levels of within-region variability. Given the relatively high standard deviations for better-performing regions and the disparity in the number of countries sampled per region, the median would provide a better picture of regional performance: the rankings stay unaltered except that South Asia (SA) and Sub-Saharan Africa (SSA) swap positions, with SSA coming last when using the median.

3.2.3. *Aggregate savings*

Researchers define aggregate savings in diverse ways: for instance, Gupta (1987) has defined it as the ratio of "gross national savings (excluding current transfers from abroad) to GNP". Other studies (e.g., Singh, 2010) use real domestic savings, where the real value is obtained by deflating the nominal gross domestic savings (using the GDP deflator). In this paper, we are interested in the amount of nominal accumulated savings available/loanable for economic activity. Thus, we define aggregate savings as "gross domestic income (GDP) minus final consumption expenditure, normalized by gross domestic income."

In addition to the theoretical elucidation in Section 2, we take a quick look at the basic relationship between our effective financial inclusion construct and various economic aggregates, such as financial institutions development (FID), accounts at financial institution, and gross domestic product (GDP) per capita in the sampled countries. Fig. 3 visually depicts the basic relationships. The figure documents a close nexus between the key macroeconomic variables, indicating that our construct speaks well to the state of the economy and its relationship with inclusiveness: countries with higher aggregate savings and countries with higher GDP per capita tend to have higher effective financial inclusion and vice versa. Importantly, to validate our construct, the index of effective financial inclusion, we also juxtapose it against one of the most used metrics of financial inclusion – ownership of an account at a financial institution. Fig. 3 shows a close relationship between the two measures, with a correlation coefficient of 0.89. Importantly, we note that the innovation (and/or advancement) of our construct is that it provides guidance on different perspectives by which stakeholders can initiate policy actions to enable or enhance financial inclusion as a development model.

As explained earlier, aggregate savings is endogenous to financial inclusion because of potential simultaneity: high levels of financial inclusion could encourage greater participation in productive economic activity by the newly included agents, which potentially increases their disposable incomes, thereby increasing aggregate savings. Similarly, we hypothesize in this paper that a larger pool of savings grows the stock of accumulated capital, thereby increasing the stock of loanable funds; and this larger stock of loanable funds makes it easy to reach constituencies that have hitherto been excluded from formal financial services. Clearly,

Table 2
Financial inclusion performance of countries and regions, per our construct, 2017.

Country	Region	Effective Financial Incl. index	Sub-indexes			
			Out of labor force	Female	Poorest 40%	Rural dwellers
A. Top 10 countries						
Korea	EAP	1.4796	1.4039	1.6158	1.3940	1.5111
Iran	MENA	1.2530	1.2403	1.2527	1.2254	1.2940
Croatia	ECA	1.2176	1.0967	1.2490	1.2079	1.3228
Mongolia	EAP	1.0836	0.9984	1.1827	1.0144	1.1450
Bahrain	MENA	1.0728	0.9975	1.0534	1.0582	1.1865
UAE	MENA	1.0584	0.8357	1.1322	1.1675	1.1161
Malaysia	EAP	1.0354	0.9694	1.1242	1.0204	1.0305
Belarus	ECA	0.9857	0.7474	1.1865	1.0084	1.0259
China	EAP	0.9760	0.9090	1.1050	0.8274	1.0763
Russia	ECA	0.9336	0.8286	1.0304	0.9112	0.9698
B. Bottom 10 countries						
Congo, Rep.	SSA	0.2079	0.2101	0.2316	0.2121	0.1783
Congo, Dem. Rep.	SSA	0.2076	0.1836	0.2600	0.1831	0.2052
West Bank & Gaza	MENA	0.1870	0.1421	0.1856	0.1181	0.3112
Sierra Leone	SSA	0.1832	0.2362	0.1843	0.1515	0.1624
Chad	SSA	0.1775	0.1686	0.1634	0.1591	0.2198
Mauritania	SSA	0.1721	0.1545	0.1847	0.1572	0.1925
Madagascar	SSA	0.1599	0.1643	0.1814	0.1403	0.1539
Pakistan	SA	0.1569	0.1568	0.0904	0.1679	0.2159
Niger	SSA	0.1185	0.0679	0.1251	0.1269	0.1560
Afghanistan	SA	0.1056	0.0452	0.0704	0.1521	0.1592
C. Regional performance	EAP	ECA	MENA	LAC	SSA	SA
Mean	0.7262	0.6350	0.5969	0.4975	0.4140	0.3984
Median	0.7351	0.5992	0.4114	0.4113	0.3815	0.3953
Standard deviation	0.4290	0.2366	0.3819	0.1836	0.2244	0.2448
No. of countries	10	20	12	18	30	6

This table reports the performance of regions and the best 10 and the bottom 10 countries on the effective financial inclusion index. We include the four sub-indexes for a comparative appreciation of their contribution to the overall index. EAP = East Asia and the Pacific; ECA = Europe and Central Asia; MENA = Middle East and North Africa; LAC = Latin America and the Caribbean; SA = South Asia; SSA = Sub-Saharan Africa.

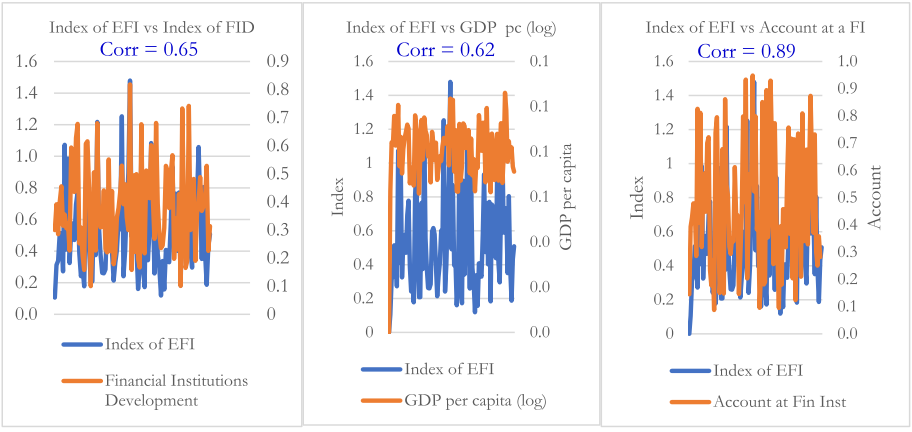

Fig. 3. Effective financial inclusion versus other performance variables, 2017.

it appears that cross-causality may exist between the two variables. Further, financial inclusion may be driven by unobserved and/or excluded variables. We use various approaches to deal with potential endogeneity, including treatment effects procedures and instrument variable regressions.

3.2.4. *Relative prevalence of non-traditional financial intermediaries*

An increment in the prevalence of microfinance institutions may ease credit constraints for the unbanked and bring them into the circle of the financially included (Inoue & Hamori, 2013; Mushtaq & Bruneau, 2019). The intensity, or prevalence, of non-traditional financial intermediaries in a country is proxied, as in this study, by "gross loan portfolio as a percentage of GDP" of microfinance institutions divided by the "deposit money banks' gross loan portfolio as a percent of GDP" (NTFI). The higher this ratio, the relatively higher is the degree of prevalence of non-traditional financial intermediation.

3.2.5. *Financial technology and infrastructure*

Mushtuq and Bruneau (2019) argue that the penetration of information and communication technology (ICT) promotes information flow and eases the analysis of creditworthiness of clients. ICT has transformed and made banking more efficient and cost-effective; thus, making it easier for financial institutions to reach previously excluded constituencies. Indeed, even microfinance institutions, which typically deal with less educated, rural, poor, and unbanked individuals, have adopted customer-oriented ICT-based solutions, switching from the more costly social networks in the process (Berger & Nakata, 2013). Researchers have documented the importance of diffusion of ICT and

utilization of financial technology in fostering financial inclusion (e.g., Andrianaivo & Kpodar, 2011; Mushtaq & Bruneau, 2019). Following these studies, we measure ICT diffusion by using a synthetic index of IT-type infrastructure, namely, fixed telephone lines (per 10,000 people), mobile cellular subscriptions (per 10,000 people) (Andrianaivo & Kpodar, 2011; Mushtaq & Bruneau, 2019) and individuals using the internet (% of population) (Allen et al., 2016; Andrianaivo & Kpodar, 2011). Like the indices of financial inclusion, we use the principal components analysis technique to derive the weights for this index. The data used here are obtained from the World Development Indicators.

3.2.6. Other financial inclusion facilitators

There are many other factors, at the macro- and household/individual-levels, which may contribute to the effectiveness of financial inclusion efforts. We attempt to control these effects by including a set of variables, guided by both extant literature and data availability. Works such as Barua et al. (2016) have found an association between government cash transfers and financial inclusion in developing countries. They explain that cash transfers may drive financial inclusion, especially if the government pays beneficiaries through accounts in financial institutions or through mobile money accounts. Thus, we include a variable called, "welfare initiatives of the government," proxied by "being a recipient of government's transfers in the last one year," obtained from the Findex database. We also include relevant occupational and inter-personal factors that may make individuals feel a tad wealthier, and thus nudge them towards considering services such as savings, investments, and money transfer conduits or facilitation of various forms of transaction. In this regard, we use a set of variables obtained from the Global Findex database, including, "received domestic remittances through a financial institution (% recipients, age 15+)", and "received wages through a financial institution account (% payment recipient, age 15+)", and "received payments for agricultural products through a financial institution (% recipients, age 15+)". For greater efficiency in the employment of these variables, we merge the three of them into one construct, a synthetic index that we label, "financial inclusion-enabling receipts."

Second, we control institutional quality factors that can enable a conducive environment for financial inclusion. Therefore, following Allen et al. (2016), we form a synthetic index of institutional quality (or governance) using "rule of law" index, which measures the extent to which agents have confidence in and abide by the rules of society, including the quality of contract enforcement, and property rights, which are important for contracting of the nature that accompanies financial inclusion; "government effectiveness", which measures perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies[13]; "political stability and absence of violence or terrorism," which measures perceptions of the likelihood of political instability and/or politically-motivated violence; and "regulatory quality," which captures perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development. We form the index using weights derived from standard deviations: $w_i = (1/\sigma_i)/\left(1/\sum_i \sigma_i\right)$. The World Governance Indicators contain the data for all these variables.

Finally, the level of development of the financial institutions and markets may be instrumental in attracting savings from individuals and households appropriating a surplus and channeling them to deficit saving units in the financial system (Allen et al., 2014). We proxy financial development by the index of financial institutions development (FID), evolved by the International Monetary Fund (IMF). For robustness checks, we also use IMF's broader index of financial development. The FID index is a composite of institutional efficiency, depth, and access, each of which is, in turn, comprised of variables that may facilitate or impede effective access to financial services. To illustrate, the financial institutional efficiency sub-index includes variables such as net interest margin, lending-deposits spread, non-interest income to total income, overhead costs to total income, and returns on assets and equity; analogously, financial institution depth is measured by private sector credit to GDP, pension fund assets to GDP, mutual fund assets to GDP and insurance premiums on various policies. Like our financial inclusion index, the IMF employs the principal components analysis (PCA) technology to develop these indexes.

Finally, we also include a variable with potential direct consequences on financial inclusion: bank concentration. The literature shows that highly concentrated banking systems are less adept at encouraging the kind of financial inclusion that we advocate for because high market power tends to nudge banks in the direction of the less risky foreign-owned firms and state-owned enterprises (Chauvet & Jacolin, 2017). Alternatively, such large banks may use their financial muscle and monopoly-like market power to usurp financial models that allow them to extend their dominance into a hitherto unfamiliar market, which may have now been shown to be profitable and/or sustainable.

3.3. Descriptive analysis

As a way of further highlighting the motivation for our work, we consider preliminary relations between representative variables of pertinent economic groups, markets, institutions, and policies. These relations can and/or do point us to potential areas deserving of further analytical/econometric exploration. But first, we report how we deal with missing data (which accounts for about 5 % of all observations) in our sample. We use predictive mean matching (PMM) with multiple imputation chain equations (MICE) to generate data for missing observations. Following scientific recommendations that more imputations are better than a few (see, e.g., Graham et al., 2007), we perform fifty (50) imputations for each missing observation with five iterations (due to 5 % missingness) at each stage. After imputation, we compare the variance (and mean) of the resulting affected series against the variance of the series with missing data, to be sure that the process has generated a series as dispersed as, or more dispersed than, the original series.

Next, we start by computing the descriptive statistics of the selected variables, which are reported in Table 3. The table shows that the value of the effective financial inclusion index over the three survey cycles was 0.5190 for the average sampled country. Young adults (people in the 15–34 years age group) experienced the lowest variation in (effective) financial inclusion with a standard deviation of 0.3093, with the worst performing country reporting 0.0281 while the best performer had an index value of 1.5192. Of the four traditionally disadvantaged (i.e., financially excluded) groups, females appear to have the highest average value of (effective) financial inclusion at 0.5831, closely followed by rural inhabitants at 0.5583. The average of aggregate (gross domestic) savings was dismal, registering a mean of 18.24 % as a proportion of gross domestic income (GDP). However, some countries recorded reasonably large aggregate savings of as much as 55.75 %, while others recorded aggregate savings as low as −53.11 % of GDP during the sampled period. The prevalence of non-traditional financial institutions (NTFIs), as already described, is a measure of the relative "presence" of non-traditional financial services providers (e.g., microfinance banks) vis-à-vis traditional financial services firms (e.g., commercial banks). A ratio above unity indicates dominance of NTFIs. In general, the ratio is

[13] https://datacatalog.worldbank.org/government-effectiveness-estimate-0

Table 3
Summary statistics, panel data.

Variable	#Obs.	Mean	SD	Min	Max
Financial inclusion metrics					
Effective financial inclusion index	270	0.5190	0.3201	0.0462	1.6188
Sub-index: out of labor force	270	0.4698	0.3150	0.0341	1.6877
Sub-index: female	270	0.5831	0.3588	0.0402	1.8830
Sub-index: young adults	270	0.4711	0.3093	0.0281	1.5192
Sub-index: rural	270	0.5583	0.3141	0.0538	1.5111
Effective financial inclusion index, Alternate	270	0.5102	0.3121	0.0457	1.5935
Explanatory variables					
Aggregate savings (domestic savings, % of GDP)	270	0.1824	0.1487	−0.5311	0.5575
Prevalence of nonbank financial institutions	270	0.0769	0.1060	0.0000	0.6851
Financial development, institutional quality, and infrastructure					
Financial institutions development (IMF index)	270	0.3797	0.1595	0.0981	0.8518
Capital market liquidity (broad money, % of GDP)	270	0.6312	0.5387	0.1187	6.3401
Governance index	270	−0.4255	0.6056	−1.9814	1.1038
Bank concentration (top 3 banks)	270	0.3977	0.3139	0.0179	100.00
Financial inclusion-enabling infrastructure (index)	270	0.2694	0.1236	0.0557	0.6995
Mobile cellular subscriptions (per 10,000 people)	270	1.0827	0.3331	0.3108	2.0898
Fixed telephone subscriptions (per 10,000 people)	270	0.1042	0.1044	0.0000	0.4479
Individuals using the Internet (% of population)	270	0.4736	0.2566	0.0125	0.9757
Individual/household level antecedents					
Financial inclusion-enabling receipts (index)	270	0.6274	0.3107	−0.0714	1.4811
Received wages	270	0.4502	0.2253	0.0168	0.9623
Received domestic remittances	270	0.3725	0.2115	0.0037	0.9485
Received government transfers	270	0.4784	0.2636	0.0577	0.9672

This table shows summary statistics for the dependent variables and explanatory variables used in the study. "#Obs." is number of observations; "SD" is standard deviation; "Min" is minimum; and "Max" is maximum; GNI is gross national income; GDP is gross domestic product; NTFI is non-traditional financial intermediaries; IMF is International Monetary Fund. Data are for 2017.

expected to lie between zero and unity – some countries have large NTFI sectors relative to the traditional financial institutions, and thus yielding/recording large ratios; the maximum observed ratio is 0.6851.

The financial system indicators show mixed outcomes, with the liquidity proxy (broad money as a percentage of GDP) reporting a relatively high level of liquidity (63.12 %) on the average in the sampled countries, while the financial institutions development index reports very high variability (minimum: 0.0981; maximum: 0.8518), which indicates a high level of disparity in the financial sectors of countries in the sample. Broadly speaking, we expect advanced financial system indicators to be supportive of financial inclusion efforts since, for example, more operationally efficient financial institutions can more easily pass on the efficiency gains to the market by extending services (e.g., credit) to financial market participants at a lower cost. The data suggests weak institutional quality (country-level governance) for the study period (negative mean value, −0.4255). Similarly, we find financial infrastructure, except mobile cellular subscriptions, to be weak, which is typical for most developing economies relative to advanced economies. The broad financial infrastructure index captures these weaknesses as well (with a mean value of 0.2694).

Finally, we observe that the use of financial institutions/platforms as channels for receiving payments, as reflected by the proportions of the population that received government transfers, remittances, and wages through a financial institution were modest during the study period. However, there are large variations across countries, with, for example, the population proportion receiving wages at a financial institution varying from 1.68 % to 96.23 %. The three proxies are used to form the index, "financial inclusion-enabling receipts", which is expected to have a positive impact on effective financial inclusion in our empirical tests. Next, we look at the cursory relationship between the explanatory variables. We present the correlation matrix in this respect in Table 4. The table shows that, except in isolated cases, correlations are low or modest. Thus, the risk of multicollinearity as a threat to our estimation is therefore low.

4. Putting the horse before the cart: empirical evidence

4.1. Initial tests of hypotheses

As a first step in our empirical analysis, we evaluate the conceptual framework in Fig. 1 by estimating Eq. (4) through the unconditional quantile regression approach of Firpo et al. (2009). Quantile regressions provide a pragmatic means of appreciating the differential influence of included independent variables (covariates) at different points in the distribution of the dependent (outcome) variable and, to that extent, it is suitable for testing the conjectures in Fig. 1. The commonly applied quantile regression framework (Koenker, 2005), used to examine the effect of an independent variable on the desired quantile of a dependent variable, conditional on specific values of other independent variables, produces results that are not generalizable to the population or interpretable in ways that can provide strong useful policy insights. This is because, unlike conditional means used in the standard OLS regression, conditional quantiles that are used in the Koenker framework do not average up to their unconditional population values (Firpo et al., 2009). To address this shortcoming, Firpo et al. (2009) proposed the unconditional quantile regression framework, which computes the marginal effect of a specified explanatory variable on the dependent variable over the distributions of other explanatory variables in the model. The recentered influence function (RIF)[14] is defined (Rios-Avila, 2020) as:

$$RIF[y_i, v(F_Y)] = v(F_Y) + IF[y_i, v(F_Y)] \quad (3)$$

[14] The influence function (IF) represents the "influence" of an individual observation on the distributional statistic (e.g., quantile). Adding back the statistic (quantile) to IF yields the re-centered influence function (RIF). For example, the influence function of the mean, $\mu = E(Y)$, is the demeaned value of the dependent variable, $Y - \mu$, so that the recentered influence function is simply the original values: $Y = \mu + (Y - \mu)$. Mathematically, the influence function, IF, is defined as, $IF[y_i, v(F_Y)] = lim_{\varepsilon \to \infty} \frac{v[(1-\varepsilon)F_y + \varepsilon H_{yi}] - v(F_Y)}{\varepsilon} = \frac{\partial v(F_Y \to H_{yi})}{\partial_\varepsilon}$, (where $H_{yi}(y) = 0 \forall y < y_i$ and $H_{yi}(y) = 1 \forall y \geq y_i$), is the influence that the observation y_i has on quantile v.

Table 4
Correlations, panel data.

		1	2	3	4	5	6	7	8
1	Domestic savings (% of GDP)	1.000							
2	Prevalence of NBFI	0.010	1.000						
3	Financial institutions index	0.149	−0.085	1.000					
4	Broad money (% of GDP)	0.095	−0.051	0.477	1.000				
5	Governance index	0.215	−0.116	0.614	0.275	1.000			
6	Bank concentration	−0.084	0.026	−0.056	−0.142	0.024	1.000		
7	FI enabling infrastructure index	0.224	−0.146	0.668	0.303	0.642	−0.091	1.000	
8	FI enabling transactions index	0.216	−0.071	0.606	0.340	0.479	−0.251	0.604	1.000

where v is the distributional statistic of interest and F is the cumulative distribution function. Eq. (3), the RIF, is the relative contribution that the observation y_i has on quantile v. The evidence shows that the unconditional quantile regression generates results that are easier to interpret from a policy perspective in the presence of other covariates in the model (see e.g., Borah & Basu, 2013). Assuming a linear relationship between $RIF[y_i, v(F_Y)]$ and the vector of explanatory variables, X, the unconditional quantile regression framework consists of running a regression of the recentered influence function of the dependent variable on the set of the included explanatory variables[15] as shown in Eq. (4):

$$RIF[y_i, v(F_Y)] = X'\beta + \varepsilon_i, E(\varepsilon_i) = 0 \quad (4)$$

In our analysis, we run seemingly unrelated regressions on quantiles of the recentered financial inclusion influence function with the estimated coefficients showing the marginal effects of changes in the mean values of each explanatory variable on the specified quantiles of the resulting distribution. We report some results of the marginal effects obtained from these regressions in Table 5. Consistent with our hypotheses, Table 5 shows that the effects of aggregate savings on effective financial inclusion tend to be larger and more statistically significant at higher quantiles. Interestingly, the coefficient estimates for the prevalence of non-traditional financial institutions tend to be negative and statistically significant for the first two quantiles, then turn positive (with lower magnitudes) in the intermediate quantiles before turning decidedly larger and significant at higher quantiles. In fact, the 70th quantile appears to represent a "threshold"[16] at which the prevalence of non-traditional financial institutions begins to robustly register our hypothesized effects on "effective financial inclusion."

The latter finding is consistent with the inference that at lower relative presence, non-traditional financial institutions do not possess adequate intermediation capacity to effectively undo the supply-side induced financial exclusion of traditionally disfavored constituencies; in fact, their measly efforts may result in further alienation of these constituencies due, for example, to frictions such as lack of trust for financial institutions (e.g., Allen et al., 2021) and interest rates (of which they are, at least initially, price takers[17]), which may explain the negative coefficients at lower quantiles. We demonstrate these effects (through the effective financial inclusion index and its broader counterpart) using the graphical displays in Fig. 4 and Fig. 5. The figures clearly demonstrate an increasing influence of aggregate savings (Fig. 4) and relative presence of non-traditional financial institutions (Fig. 5) on effective financial inclusion. Thus, our results so far provide strong evidence that a growing pool of aggregate savings and a growing relative prevalence of non-traditional institutions have higher effects on financial inclusion among the traditionally excluded population segments in developing countries – thus, supporting our hypothesis regarding what we, more broadly, in this paper, dub "effective financial inclusion".

4.2. Further exploration of "the horse pulls the cart" hypothesis

Although elegant to the extent that it recognizes the fact that different levels of aggregate savings and prevalence of non-traditional financial institutions may affect financial inclusion differently, the procedure in Section 4.1 employs the ordinary least squares (OLS) regression method, which has various limitations. For example, the OLS method does not account for potential endogeneity arising from possible omitted variable bias and simultaneity. We deal with these issues in this section, by using various forms of a set of treatment (causation) methodologies based on the recentered influence functions (RIF).

4.2.1. Causal effects

We deploy the recentered influence functions (RIF) treatment-effects methodology (Firpo & Pinto, 2016), an identification strategy with the capacity to quantify discrepancies in the consumption of financial services (between treated and control subsamples), that yields intuitive results with straightforward policy implications. The procedure begins, as is conventional, by defining a joint distribution function $F_{Y_1,Y_0,X,T}(\bullet)$ that describes the potential outcomes, Y_0 and Y_1, exogenous independent variables, X, and a binary treatment variable, T. Realized outcomes, Y, depend on whether the sampled individual is a member of the treated subsample or the control subsample: $Y = TY_1 + (1-T)Y_0$. Suppose that the distributions of potential outcomes, Y_0 and Y_1, are independent of observed characteristics, X, and that the number of observations is so large as to have individuals with similar observed characteristics in both treated and control subsamples. Thus, Firpo and Pinto (2016) propose the estimation of treatment effects using RIF as in Eq. (5).

$$T \times RIF[y, v(\widehat{F}_{y_1})] + (1-T) \times RIF[y, v(\widehat{F}_{y_0})] = b_0 + b_1 T + b_2 X + \varepsilon \quad (5)$$

[15] The estimation is done in two steps. First, one obtains the unconditional partial effects (UPE), $E\{RIF[y_i, v(F_Y)]\} = E[X'\beta + \varepsilon_i] = \overline{X}'\beta$, where $\overline{X}$ is the unconditional mean of X. In the second step, the unconditional partial effects (UPE) are obtained as, $\partial v(F_Y)/\partial \overline{X}_k = \beta_k$. Thus, if the distribution of x_k changes such that its unconditional mean increases by 1 unit, the quantile, v, is expected to change by β_k units (Rios-Avila, 2020). However, estimating the RIF this way has the shortcoming that it captures only the mean of the distribution of X. To address this shortcoming, one typically introduces higher order polynomials that capture the nonlinearities in X (e.g., adding $(x_i - \overline{X})^2$ makes the UPE a function of the mean and variance of X, both of which change independent of each other).

[16] In the context of this observation, we did attempt to explicitly explore (estimate) a threshold regression, but the limited data of the pseudo-panel could not support this deeper empirical exploration. Over time, and with more relevant time-series accumulated, this exploration would be a worthwhile future research agenda.

[17] In the intermediate term, NBFIs can rely on social collateral available through group lending practices to extend favorable lending terms (including lending rates) to their traditionally disfavored clients who commonly do not have asset-based collateral. Before group lending takes root, however, NBFI's, which are less endowed with capital relative to the more established commercial banks, may force them to extend loans at potentially higher interest rates than commercial banks due to higher adverse selection risk among their core clients. This may effectively thwart financial inclusion efforts.

Table 5
Marginal effects of aggregate savings and non-traditional financial institutions on effective financial inclusion.

Dependent variable	Effective financial inclusion index		Broader EFI index		Population out of labor force		Females		Poorest 40 % of population		Rural dwelling	
Quantile	Agg Savings	Prev NBFI	Agg Savings	Prev NBFI	Agg Savings	Prev NBFI	Agg Savings	Prev NBFI	Agg Savings	Prev NBFI	Agg Savings	Prev NBFI
10	0.107	−0.566**	0.211*	−0.531**	0.307**	−0.484**	0.097	−0.561*	0.114	−0.553**	0.155	−0.510*
	(0.129)	(0.250)	(0.130)	(0.252)	(0.120)	(0.234)	(0.155)	(0.302)	(0.115)	(0.223)	(0.147)	(0.285)
20	0.170	−0.462*	0.127	−0.459**	0.177	−0.440*	0.154	−0.428	0.263**	−0.142	0.145	−0.577**
	(0.126)	(0.244)	(0.124)	(0.241)	(0.116)	(0.225)	(0.145)	(0.282)	(0.119)	(0.231)	(0.141)	(0.274)
30	0.292**	−0.127	0.207*	−0.171	0.211*	−0.164	0.455***	−0.105	0.275**	−0.192	0.300**	−0.229
	(0.124)	(0.240)	(0.121)	(0.235)	(0.114)	(0.221)	(0.139)	(0.270)	(0.116)	(0.226)	(0.136)	(0.265)
40	0.316**	0.085	0.297**	0.025	0.402***	0.131	0.343**	0.011	0.240*	0.019	0.199	−0.091
	(0.128)	(0.249)	(0.123)	(0.239)	(0.119)	(0.230)	(0.143)	(0.278)	(0.124)	(0.241)	(0.138)	(0.268)
50	0.392***	0.126	0.400***	0.158	0.373***	0.108	0.597***	0.246	0.389***	0.251	0.395***	0.209
	(0.131)	(0.254)	(0.129)	(0.251)	(0.124)	(0.242)	(0.149)	(0.290)	(0.128)	(0.249)	(0.139)	(0.269)
60	0.436***	0.407	0.393***	0.326	0.456***	0.372	0.469***	0.413	0.390***	0.360	0.351**	0.269
	(0.151)	(0.294)	(0.141)	(0.274)	(0.149)	(0.290)	(0.179)	(0.348)	(0.142)	(0.276)	(0.148)	(0.288)
70	0.602***	0.781**	0.589***	0.814**	0.446***	0.684**	0.564***	0.945**	0.643***	0.930**	0.632***	0.870**
	(0.178)	(0.346)	(0.173)	(0.335)	(0.167)	(0.324)	(0.200)	(0.388)	(0.194)	(0.376)	(0.183)	(0.355)
80	0.731***	0.805*	0.746***	0.828**	0.479**	1.106**	0.822***	1.238**	0.605***	0.643	0.750***	0.874*
	(0.239)	(0.465)	(0.243)	(0.471)	(0.220)	(0.427)	(0.263)	(0.510)	(0.235)	(0.457)	(0.231)	(0.448)
90	0.781**	1.028*	0.919***	0.962*	0.673*	0.953	0.829**	0.627	0.876***	0.643	1.044***	0.696
	(0.307)	(0.596)	(0.299)	(0.581)	(0.362)	(0.704)	(0.337)	(0.655)	(0.327)	(0.636)	(0.304)	(0.591)
Controls	Yes		Yes		Yes		Yes		Yes		Yes	
R-squared	0.259–0.550		0.259–0.550		0.255–0.529		0.252–0.533		0.263–0.533		0.255–0.546	
p-value of chi-square	0.000		0.000		0.000		0.000		0.000		0.000	

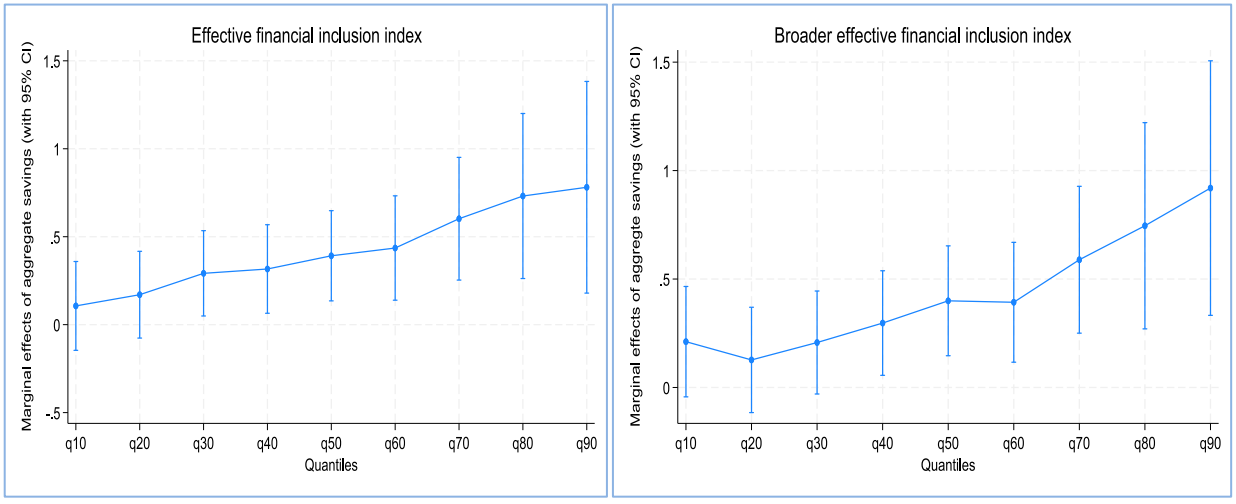

Fig. 4. Average marginal effects of aggregate savings on effective financial inclusion.

where v is the distributional statistic of interest (the median in our case here), $\widehat{F}$ are the cumulative distribution functions, estimated separately for the treated (high aggregate savings countries) and control (low aggregate savings countries) groups. We estimate Eq. (5) using the weighted least squares method.[18] The RIF approach has several advantages compared to traditional treatment methodologies. First, it is simple to implement; second, it eases the computation of the contributions of individual covariates on the aggregate decomposition, and third, it can be used with any statistic for which a RIF can be defined (Rios-Avila, 2020). The treatment variable is the dichotomous form of aggregate savings, defined to take the value of 1 if aggregate savings of a country is higher than or equal to the median aggregate savings of the sampled countries and zero otherwise. The results, reporting the average treatment effects, are presented in Table 6. The results are interpreted following recent recommendations of Rios-Avila and de New (2022).

The key result is that the effect of aggregate savings on effective financial inclusion is positive and significant in the sampled developing countries. That is, a unit change in the median value of aggregate savings (domestic savings as a ratio of GDP) elicits between 0.159- and 0.166-unit increment in the (index of) effective financial inclusion in a representative sampled country. Prevalence of non-traditional financial institutions has a negative and significant effect on effective financial inclusion, a reflection of the low presence of non-traditional financial institutions relative to commercial banks in the sample. As is clear in Table 3, the presence of non-traditional financial institutions in the average sampled country is paltry (an average of 0.08, out of a possible 1.00). As explained in Section 4.1, at such low levels of relative

[18] The weights for the least squares regression are computed as $\widehat{\omega}(x) = T\widehat{\omega}_1(x) + (1-T)\widehat{\omega}_0(x)$, where $\widehat{\omega}_1(x) = P(T=1)/P(T=1|X=x)$ and $\widehat{\omega}_0(x) = [1-P(T=1)]/[1-P(T=1|X=x)]$, such that $P(T=1)$ is the overall probability that an individual is assigned to the Treatment group and $P(T=1|X=x)$ is the probability that an individual is assigned to the Treatment group conditional on the observed characteristics (Rios-Avila, 2020). Consistent with the rest of our work, we estimate these probabilities using Probit regression.

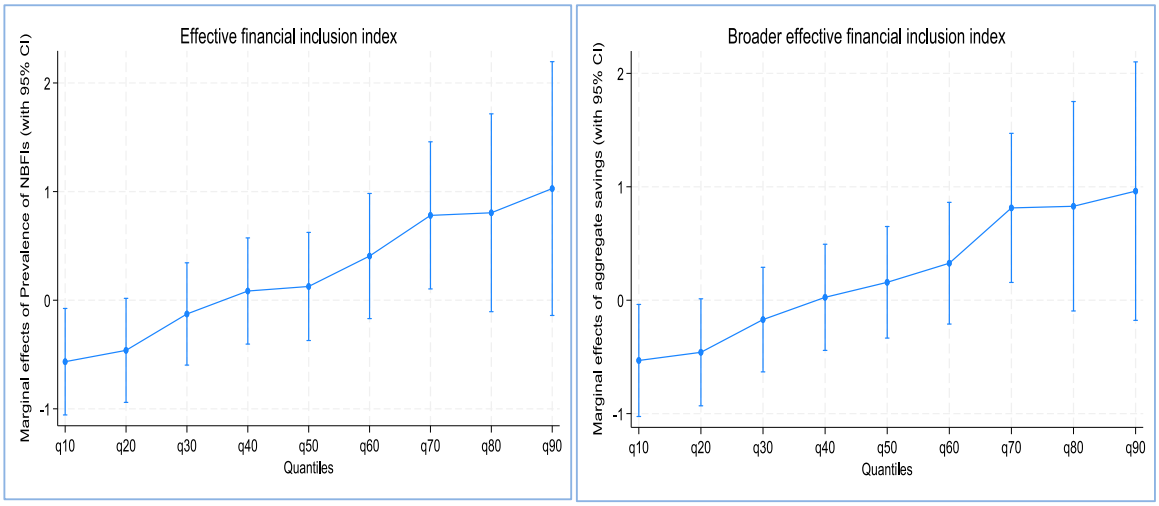

Fig. 5. Average marginal effects of "prevalence of NBFI" on effective financial inclusion.

Table 6
Results of RIF treatment-effects regressions.

Dependent variable	Effective FI index	Broader Effective FI index	Effective financial inclusion sub-indexes			
			Population out of labor force	Females	Poorest 40% of population	Rural dwelling
Aggregate Savings (T)	0.166***	0.159***	0.146***	0.213***	0.133***	0.155*** (0.046)
	(0.047)	(0.045)	(0.045)	(0.055)	(0.045)	
Prevalence of NBFI	−0.452**	−0.458**	−0.469**	−0.478**	−0.481**	−0.490** (0.192)
	(0.191)	(0.195)	(0.235)	(0.203)	(0.224)	
Interaction	0.896	1.013	1.264	0.340	1.066	1.102 (1.077)
	(1.076)	(1.073)	(1.221)	(1.175)	(1.191)	
Financial Infrastructure	0.096	0.057	0.121	0.003	0.048	0.044 (0.225)
	(0.231)	(0.220)	(0.218)	(0.273)	(0.229)	
Financial development	0.568***	0.435***	0.445***	0.661***	0.453***	0.464*** (0.146)
	(0.155)	(0.146)	(0.147)	(0.177)	(0.153)	
Bank concentration	0.005***	0.004***	0.004***	0.006***	0.004***	0.004*** (0.001)
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	
State governance	0.004	0.011	0.001	0.040	0.028	0.028 (0.045)
	(0.046)	(0.044)	(0.043)	(0.055)	(0.043)	
Use of platforms	0.255***	0.275**	0.267***	0.299***	0.266***	0.280*** (0.078)
	(0.080)	(0.077)	(0.077)	(0.095)	(0.077)	
Constant	−0.031	0.020	−0.047	−0.014	−0.003	0.039 (0.084)
	(0.087)	(0.083)	(0.083)	(0.103)	(0.087)	
Time effects	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.44	0.44	0.43	0.46	0.42	0.44
p-value of F	0.00	0.00	0.00	0.00	0.00	0.00
Observations	265	265	265	265	265	265

T indicates the treatment variable. The reported coefficient is the average treatment effect (ATE). In parentheses are robust standard errors. *, $p < 0.10$; **, $p < 0.05$; and ***, $p < 0.01$.

presence, non-traditional financial institutions would expectedly retard effective financial inclusion. The median ratio of gross loans of nonbank financial institutions to gross loans of commercial banks is a paltry 0.038 (see Table 3), the low lending power (alongside characteristic high lending interest rate) effectively diminish their potential to improve access to credit (an important aspect of effective financial inclusion) among previously excluded individuals.

A seemingly surprising, but interesting, finding is that bank concentration is consistently significant and positive, implying that countries with a substantial proportion of banking assets held by few large banks (that can perhaps usurp the financing models of NBFIs to expand their pool of costumers) have higher effective financial inclusion prospects. Although positive, the economic significance (magnitude of coefficient estimates) of bank concentration is low, suggesting that the effect is nuanced. Specifically, some recent studies find that although bank market power (concentrated banking sectors give more market power to a few large banks) promotes financial deepening (access and availability of financial products), beyond some thresholds, they are not desirable for promoting usage of financial services (Kebede et al., 2021). Therefore, the low economic importance of the coefficient estimates implies that bank concentration may, at best, only tangentially foster financial inclusion of the kind investigated in this paper.

Expectedly, and in line with a similar logic as the interpretation of the "bank concentration" result, "financial institutions development" and "use of financial institutions as a platform for receiving disbursements such as wages and cash transfers from government" have a positive effect on "effective financial inclusion." In this respect, it is important to emphasize the distinction between access to financial services (e.g., as a conduit for government transfers, remittances, or wages) and "effective financial inclusion" (our financial inclusion construct) which speaks to the utilization of financial services for welfare enhancement by way of, for example, credit extension (e.g., to finance

children's school fees, and healthcare services), and for savings (to facilitate consumption smoothing). The positive and significant coefficient of this variable, therefore, suggests that such access may facilitate effective utilization of financial products through, for example, such channels as greater exposure to, and hence knowledge of, financial products or services (beyond the little exposure, if any, that individuals without such access may enjoy), and advice from employees of the financial institutions involved.

4.2.2. How large is the financial inclusion setback due to low aggregate savings?

Having established an unequivocal role for aggregate savings on effective financial inclusion, it is important to ask the question of how large, exactly, is the magnitude of the difference, in effective financial inclusion, between countries with high aggregate savings and those with low aggregate savings. To answer this question, we deploy the RIF of Firpo et al. (2018) to execute the Oaxaca-Blinder-type decomposition. As before, we divide the sample into the treated group (aggregate savings equal to or higher than the sample median, called high aggregate savings) and the control group (low aggregate savings) and estimate Eq. (6).

$$\Delta v = \left[\left(\overline{X}^{c} - \overline{X}^{0}\right)'\widehat{\beta}_0 + \overline{X}^{c'}\left(\widehat{\beta}_c - \widehat{\beta}_0\right)\right] + \left[\overline{X}^{1'}\left(\widehat{\beta}_1 - \widehat{\beta}_c\right) + \left(\overline{X}^{1} - \overline{X}^{c}\right)'\widehat{\beta}_c\right] \quad (6)$$

where Δv, the gap in the distributional statistics of the treated subsample and the nontreated group, is constructed as $RIF\left[y, v\left(\widehat{F}_{y_1}\right)\right] - RIF\left[y, v\left(\widehat{F}_{y_0}\right)\right]$, such that "c" is the counterfactual; and 1 and 0 represent the treated and untreated groups, respectively. The terms, $\left(\overline{X}^{c} - \overline{X}^{0}\right)'\widehat{\beta}_0$ and $\overline{X}^{1'}\left(\widehat{\beta}_1 - \widehat{\beta}_c\right)$, are the "pure" composition (explained) effect and the "pure" unexplained effect components, respectively; while $\overline{X}^{c'}\left(\widehat{\beta}_c - \widehat{\beta}_0\right)$ and $\left(\overline{X}^{1} - \overline{X}^{c}\right)'\widehat{\beta}_c$ are, respectively, the specification and reweighting errors. A significant and large reweighting error signifies poor identification of the counterfactual and/or poor specification of the model used to estimate the reweighted factors; a significant specification error may indicate an incorrect estimation of the distributional statistic (Rios-Avila, 2020). As before, Eq. (6) is estimated using weighted least squares.

Table 7 reports results of the Oaxaca-Blinder decomposition. We focus on the explained component, which has economic meaning in the context of our study. As discussed, the explained component is further broken down into a pure effect (what the included variables explain) and a specification error, reported in Panel A and Panel C, respectively, of Table 7. The specification error is consistently small in magnitude and statistically insignificant, thus indicating that the RIF has not incorrectly estimated the distributional statistic. Overall, the "gap" in effective financial inclusion between high savings economies and low savings economies is approximately 0.16 (in index terms). Therefore, efforts to alleviate financial exclusion in developing countries ought to include targeted policies aimed at improving domestic savings. However, there are notable differences in the categories of traditionally disadvantaged individuals/households with the gap being comparatively smaller for individuals in the poorest 40% of the population (0.11) and especially large for women (0.17).

Panel B of Table 7 reports the decomposition of the pure explained effects into the contributions of the included explanatory variables. The single most important variable explaining the financial inclusion gap is "bank concentration". Now, the pure explained component of the gap is positive, indicating that the variables explaining it (those that are significant) tend to reverse the financial inclusion gap. In particular, bank concentration is statistically significant for all regressions, further confirming our surprising result in Table 6 that it has a significant and positive contribution in supporting effective financial inclusion. A similar observation is made in respect of usage of financial institutions as the platform for receiving financial flows. These results are plausible, especially where the prevalence of non-traditional financial institutions has not attained the necessary or critical presence ("threshold" as per Table 5) that will begin to reflect the many espoused benefits of NBFIs in supporting financial inclusion initiatives.[19]

5. Robustness checks

5.1. Traditional panel regressions

Thus far, our pseudo-panel analysis has focused on treatment effects. However, it is additionally useful to explore whether our results hold in traditional panel settings, including with more formal endogeneity controls. We explore this by estimating Eq. (7):

$$\begin{aligned}\mathrm{EFI}_{it} = {} & \alpha + \beta_1 \mathrm{Savings}_{it} + \beta_2 \mathrm{PrevNBFI}_{it} + \beta_3 (\mathrm{Savings}_{it} \times \mathrm{PrevNBFI}_{it}) \\ & + \delta' \mathrm{Controls}_{it} + \varepsilon\end{aligned} \quad (7)$$

where *Savings* is aggregate savings; and *PrevNBFI* is the relative prevalence of non-traditional financial institutions. Table 8 reports results of various kinds of panel analysis. In column (1), we control country-level fixed effects and time-related effects; column (2) controls time-related effects only, while column (3) controls none of the unobserved variables. In column (4), and in column (5) (where we use the alternate financial inclusion index) we explicitly control endogeneity using Baltagi and Li (1992)'s error components two-stage least squares (EC2SLS) regression which is efficient for finite data. This procedure, like all similar techniques, requires a judicious selection of instrument variables. An instrument variable should be strongly correlated with the endogenous variable (relevance condition) but associated with the dependent variable (outcome) only indirectly through its association with the endogenous variable (exclusion condition) (Windmeijer et al., 2019).

In this study, the endogenous explanatory variable, as explained, is aggregate savings (log of domestic savings as a proportion of GDP). The literature has identified several variables that are related to savings but not directly related to financial inclusion, including military spending, which typically has a negative relationship with savings (Deger & Smith, 1983), especially in developing countries (Deger, 1986); and population growth, which also tends to be negatively associated with savings because growing populations lead to higher child dependency (Cook, 2005), but this relationship might also be positive if population growth increases the number of potential savers under the life cycle hypothesis of savings (Modigliani & Ando, 1957). We use these two variables as instruments in our regressions. The results consistently indicate that higher levels of aggregate savings promote effective financial inclusion in the sampled developing countries.

5.2. Cross sectional regressions

As part of our robustness checks, we conduct additional tests of the hypotheses and conjectures laid out in Section 2, using a cross-sectional dataset. Since 2017 had more countries with recent data than 2021 (whose data were collected during the covid period and some countries failed to conduct the interviews and submit data to Findex), we use the 2017 data to ascertain whether the pseudo-panel employed in section 4.1 yields results that are robust to the form of estimation deployed to test our first set of hypotheses.

[19] We add a time dummy (equal to 1 if the year is either 2014 or 2017 and 0 otherwise), to deal with potential nonlinearity, the squared values of aggregate savings (as a continuous variable) and use of platforms. The time dummies are generally significant in our regressions while the two squared variables are consistently insignificant. However, we do not report the three additional variables in Table 7 to maintain comparability with Table 6.

Table 7
RIF Oaxaca-Blinder decomposition results.

Dependent variable	Effective FI index	Broader Effective FI index	Effective financial inclusion sub-indexes			
			Population out of labor force	Females	Poorest 40% of population	Rural dwelling
A. Financial inclusion gap						
Low aggregate savings	0.383*** (0.033)	0.384***	0.334***	0.441*** (0.040)	0.348***	0.443***
		(0.032)	(0.030)		(0.032)	(0.036)
High aggregate savings	0.542*** (0.056)	0.539***	0.486***	0.614*** (0.064)	0.457***	0.588***
		(0.053)	(0.050)		(0.054)	(0.057)
Difference/gap	−0.159** (0.064)	−0.155**	−0.152***	−0.173** (0.074)	−0.110*	−0.145**
		(0.061)	(0.058)		(0.062)	(0.067)
Pure explained	0.357** (0.174)	0.353** (0.155)	0.316*	0.369** (0.167)	0.330** (0.161)	0.359** (0.155)
			(0.164)			
B. Composition						
Prevalence of NBFI	−0.001 (0.003)	−0.003	−0.001	−0.008 (0.011)	0.000	−0.003
		(0.005)	(0.003)		(0.003)	(0.005)
Interaction	−0.010 (0.018)	−0.004	−0.010	−0.014 (0.025)	−0.008	−0.002
		(0.010)	(0.018)		(0.015)	(0.008)
Financial Infrastructure	0.024 (0.031)	0.003	0.024	0.063 (0.041)	0.009	−0.009
		(0.029)	(0.031)		(0.030)	(0.033)
Financial development	0.008 (0.024)	0.027	0.008	0.033 (0.032)	−0.008	0.051*
		(0.024)	(0.024)		(0.024)	(0.030)
Bank concentration	0.207** (0.083)	0.193*	0.207**	0.221** (0.109)	0.143*	0.156*
		(0.080)	(0.083)		(0.079)	(0.087)
State governance	0.042 (0.030)	0.042	0.042	0.051 (0.038)	0.058*	0.044
		(0.030)	(0.030)		(0.033)	(0.033)
Use of platforms	0.234* (0.136)	0.235*	0.234*	0.123 (0.111)	0.257*	0.270*
		(0.135)	(0.136)		(0.144)	(0.151)
Time effects	YES	YES	YES	YES	YES	YES
C. Diagnostics						
Specification error	−0.241 (0.181)	−0.236 (0.160)	−0.231	−0.210 (0.174)	−0.226	−0.223 (0.160)
			(0.170)		(0.167)	
Reweighting error	−0.227 (0.143)	−0.225	−0.224	−0.253	−0.192	−0.200
		(0.142)	(0.146)	(0.166)	(0.138)	(0.148)

Table 8
Abridged panel data regression results.

Dependent variable	Effective financial inclusion (EFI) index				Broader EFI index
	(1)	(2)	(3)	(4)	(5)
Aggregate savings	0.180** (0.090)	0.329*** (0.081)	0.314*** (0.086)	0.484** (0.190)	0.457**
					(0.181)
Prevalence of NTFI	0.035 (0.096)	0.067 (0.092)	0.096 (0.094)	0.171	0.150
				(0.121)	(0.123)
Interaction	0.206 (0.392)	−0.016 (0.409)	−0.120 (0.415)	−0.475	−0.359
				(0.599)	(0.573)
Control variables	Yes	Yes	Yes	Yes	Yes
Time effects	Yes	Yes	No	No	No
Fixed effects	Yes	No	No	No	No
Endogeneity control				Yes	Yes
R-squared (overall)	0.61	0.78	0.79	0.78	0.78
p-value of Wald-stat	0.00	0.00	0.00	0.00	0.00
# observations	270	270	270	270	270

The table presents coefficient estimates of panel data regression (clustered robust standard errors in parentheses). Aggregate savings are proxied by gross domestic savings as a proportion of gross domestic income. To control endogeneity, we use Baltagi and Li (1992)'s error components two-stage least squares (EC2SLS) regression, which is efficient for finite data. ***, **, and * respectively represent statistical significance at 1 %, 5 % and 10 % levels.

5.2.1. Data summary

We begin by describing the 2017 data. The associated descriptive statistics are reported in Table A2 of the Appendix. The average of aggregate savings was quite low, registering a mean of 21.91 % as a proportion of gross domestic product (GDP). However, some countries recorded reasonably large aggregate savings of as much as 46.60 %, while others recorded aggregate savings as low as 2.61 % of GDP in 2017. The prevalence of non-traditional financial institutions (NTFIs), a measure of the relative "presence" of non-traditional financial services providers vis-a-vis traditional financial services providers, is low, consistent with the overall results discussed earlier; as before, a few countries report large ratios, the maximum observed ratio being 0.5902. Broadly, the key patterns in the 2017 data appear to mirror those of the stacked cross-sections. Further, except in isolated cases, and especially for variables that are excluded from the same regression because they tend to carry the same information (e.g., financial institutions index and financial development index), correlations are low (Appendix, Table A3), so the multicollinearity threat to our estimation is low.

5.2.2. Empirical results of cross-sectional tests

Continuing the robustness checks of our baseline results of the first two hypotheses, we revisit the estimation of Eq. (7) using cross-sectional data. Specifically, we estimate Eq. (8):

$$\mathrm{EFI}_i = \alpha + \beta_1 \mathrm{Savings}_i + \beta_2 \mathrm{PrevNTFI}_i + \beta_3 (\mathrm{Savings}_i \times \mathrm{PrevNTFI}_i) + \delta' \mathrm{Controls}_i + \varepsilon_i \quad (8)$$

As explained in Sections 3.2 and 5.1, Eq. (8) likely suffers from the endogeneity problem due to both omitted variables bias and possible

Table 9
GMM regression results of saving on financial inclusion, 2017.

Dependent variable	Index of effective financial inclusion	Effective financial inclusion sub-index				Broader effective financial inclusion index
		Population out of labor force	Females	Poorest 40% of population	Rural dwellers	
Aggregate savings	0.864***	0.848**	0.528*	1.186***	0.711*	0.934***
	(0.309)	(0.323)	(0.310)	(0.350)	(0.411)	(0.310)
Prevalence of	0.384	0.333	0.072	0.647**	0.378	0.427
NTFI	(0.296)	(0.292)	(0.298)	(0.313)	(0.371)	(0.300)
Interaction	−1.979	−1.826	−0.644	−3.015**	−1.776	−2.153
	(1.269)	(1.296)	(1.357)	(1.377)	(1.614)	(1.285)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R-sq	0.670	0.629	0.703	0.620	0.644	0.636
p-value of:						
Wald	0.000	0.000	0.000	0.000	0.000	0.000
Hansen	0.608	0.907	0.720	0.328	0.340	0.697
# Obs.	96	96	96	96	96	96

This table presents coefficient estimates of the GMM regression (robust standard errors in parentheses). NTFI represents non-traditional financial institutions. # Obs. stands for number of observations. ***, **, and * respectively represent statistical significance at 1 %, 5 % and 10 % levels.

simultaneity. Using the same instruments variables employed in Section 5.1, we test the empirical model in Eq. (8) using the generalized method of moments (GMM) estimation. The results, reported in Table 9, expectedly show that aggregate savings significantly and positively affect our overall financial inclusion construct and thus support our definition of "effective financial inclusion". The sub-indexes of the financial inclusion construct perform equally well in respect of our hypothesis that high aggregate savings are important in expanding reach and utilization of financial products and services. However, the sub-index for "rural dwellers" though positively related to aggregate savings, appears not to respond highly significantly to it. A possible explanation for this is the relative scarce presence of financial institutions (and their agents) in such areas, which may imply that only a lower proportion of the larger pool of savings (which constitute loanable funds of financial institutions) might be available to rural dwellers. This outcome may be attributed to the high opportunity costs of lost daily earnings (given that most rural dwellers are involved in the informal economy) and high travel costs, both of which make it economically burdensome to travel beyond their villages to urban/peri-urban areas to access such institutions/agents.

One may argue that the issue of distance or remoteness of rural areas from financial institutions or their agents might be addressed by digital finance platforms or products such as mobile money. However, the evidence suggests that rural dwellers generally have lower literacy rates than their urban and peri-urban counterparts, even in developed countries (e.g., see Hillier et al., 2022, for Canadian evidence). This implies that availability of mobile money services may address their financial access problems, without necessarily addressing the problem of lack of effective usage. For example, where effective usage may require applying for credit to send a child to school and the application process is "decentralized" in the sense that it can be done online, a functionally illiterate rural dweller, who typically needs assistance with such processes, may still not be able to make the application due to inability to effectively use their mobile device to complete and submit the application.

In addition to the four sub-indexes and broad index reported, the broader index incorporates two other sub-indexes for two other traditionally excluded population segments – "young adults" and "individuals with primary school education". Results in Table 9 show that the construct is as sensitive to aggregate savings (and the other control variables that report statistically significant coefficients) as the baseline broad construct. In other words, our baseline result is robust to the broader (effective) financial inclusion construct that includes other possible groups of "the financially excluded".

5.2.3. *Alternative proxy for aggregate savings*

We use gross national savings (% of GNI) under the GMM framework rather than gross domestic savings (% of GDP) which has been used in all the tests presented until now. As reported in Table 10 (which contains results of this additional robustness check), the sensitivity of large savings pools to financial inclusion initiatives remains statistically significant and economically important, as in earlier estimations that used a different proxy for aggregate savings.

Table 10
GMM regression results for alternative aggregate savings proxy, 2017.

	EFI index	Broader EFI index
Aggregate savings	2.890* (1.622)	3.080* (1.737)
Prevalence of NTFI	2.183 (1.376)	2.328 (1.467)
Interaction	−0.931 (0.581)	−0.990 (0.621)
Controls	Yes	Yes
Adj. R-squared	0.080	0.000
Wald [p-value]	0.000	0.000
Hansen [p-value]	0.671	0.743
No. of observations	96	96

This table reports coefficient estimates of the GMM regression (robust standard errors in parentheses). ***, **, and * respectively represent statistical significance at 1 %, 5 % and 10 % levels. EFI is effective financial inclusion.

6. The cart and attendant welfare implications — successful financial inclusion

An important implication of "effective financial inclusion" is that it should positively impact the welfare of "the included" if indeed financial inclusion is effective – i.e., yielding what we have dubbed "successful financial inclusion" in this paper. The literature has long associated successful financial inclusion efforts/initiatives with improvements in such metrics as households' or individuals' consumption patterns, adequate nutrition, improved healthcare access, higher school enrollment, poverty reduction, greater self-employment, better SMMEs' performance, and employment creation by young enterprises, among others (e.g., Pande & Burgess, 2005; Bruhn & Love, 2009; Ashraf et al., 2010; Dupas & Robinson, 2013; Kaboski et al., 2014). Thus, these performance metrics can be used, as indicators of welfare, for investigating the likely occurrence of "successful financial inclusion".

The literature on the link between financial inclusion and welfare is burgeoning. Thus, our objective here is not merely to test whether financial inclusion influences individual/household welfare (extant literature has demonstrated that amply); but, more crucially, we seek to further demonstrate the validity of our "effective financial inclusion" construct. Many of the recent studies use indicators of poverty (e.g., Imai et al., 2012; Mushtaq & Bruneau, 2019; N'dri & Kakinaka, 2020), household consumption (e.g., Mallick & Zhang, 2019) or household consumption diversification (Chakrabarty and Mukherjee, 2021) to

proxy welfare. Following this literature, we use many alternate measures that include poverty (percentage of the population living on less than USD 1.90 a day), GDP per capita (as a proxy for broad economic development), as well as relatively novel proxies such as secondary school enrollment, self-employment, and proportion of the population that is undernourished (all obtained from World Bank's World Development Indicators).

However, unlike the heretofore typical study in the literature which uses supply-side measures of financial inclusion, such as (aggregate) gross loan portfolios (e.g., Imai et al., 2012), number of MFI borrowers per capita (e.g., Mushtaq & Bruneau, 2019), or relatively mundane demand-side measures such as ownership of account at a financial institution or ownership of a credit card (Mallick & Zhang, 2019), which do not necessarily guarantee successful utilization of financial services (i.e., usages with welfare enhancing effects), we deploy our now familiar and copiously described demand-side index of "effective financial inclusion" to test this key relationship of interest in this paper.

As indicated, 2017 provides us with the largest number of countries with the largest number of financial inclusion variables in the Findex database. Further, some important variables (e.g., contract enforcement, loan portfolios of microfinance institutions, etc., which we use, as explained in subsequent paragraphs, as instrument variables in the regression) are not available, at the time of writing, beyond 2019, while data on other variables (e.g., ethnic fractionalization, also used as an instrument) are only available at one point in time: 2013. Given these data limitations, we are unable to use the pseudo-panel approach to run the tests in this section. Therefore, as in Section 5.2, we deploy the 2017 data to estimate the empirical specification in Eq. (9):

$$Welfare_i = \gamma_0 + \gamma_1 EFI_i + \Gamma' Controls_i + \epsilon_i \quad (9)$$

where *Welfare* and *EFI* are proxies of welfare and effective financial inclusion, respectively, as described in the opening paragraph of this section. We hypothesize that the coefficient γ_1 is different from zero; *Controls* is a vector of macro-level variables, including gross savings (as a percent of GNI), (log of) general government consumption expenditure (constant 2015 US$), IMF's financial development index (as defined earlier, obtained from the IMF database), domestic credit to the private sector (% of GDP), ILO modeled estimates of labor force participation rate (total, % of total population 15 years and above), new business density (new registrations per 1000 people aged 15 years and above), agriculture, forestry, and fishing value added (% of GDP), government expenditure on education (total, % of GDP), and dummy variables representing country income levels; ϵ is the random error term and the index i represents "country", our unit of analysis.

Eq. (9) is estimated using Limited Information Maximum Likelihood (LIML) method to guard against potential endogeneity bias arising from possible cross-causality between welfare and financial inclusion. For instance, an increment in usage of financial services such as credit (a part of effective financial inclusion) may promote household consumption or self-employment. Thus, we need a set of instrument variables that fit the usual restrictions, namely: that it be correlated with financial inclusion but with no direct causal effect on the welfare metrics. Our choice of instrument variables is guided by the literature (e.g., Imai et al., 2012; Mushtaq & Bruneau, 2019), and includes cost of contract enforcement, lag of a three-year average of gross loan portfolio of microfinance institutions (MFIs) normalized by total number of MFI branches (data obtained from the World Bank's MIX database), the 2013 index of ethnic fractionalization (Drazanova, 2020), and differenced (2017 minus 2014) effective financial inclusion index.

The baseline results, which employ large sample statistics and no adjustments in standard errors are reported in Tables 11. The results show that our financial inclusion construct reports theoretically sound coefficient signs: for example, a 10 % improvement in effective financial inclusion increases secondary school enrollment by 2.5 % and causes a decline in the proportion of the population that is undernourished by 0.16 %, both of which are statistically significant. Even more telling is our result on GDP per capita, which indicates that an improvement in effective financial inclusion would elicit a highly statistically significant positive impact on "economic development" of the developing countries in our sample. In Table 12, where we cluster robust standard errors by country, and adjust for small samples, our results remain similar, with a slight reduction in the level of statistical significance (from 1 % to 5 %) in the coefficient of the GDP per capita equation.

Other interesting findings reported in Tables 11 and 12 include the favorable impact of gross savings and educational expenditure on secondary school enrolment; and of gross savings as well as agricultural value added on the population living on less than USD 2 a day. More interestingly, we provide direct evidence that people living in low-income countries are more vulnerable to poor welfare such as inability to enroll their children in secondary schools, undernourishment, and

Table 11
Estimates of successful financial inclusion – i.e., relations between effective financial inclusion and welfare.

Dependent variable	GDP per capita (PPP adjusted)	Secondary school enrolment	Self-employment	Poverty headcount (below $1.90)	Undernourished population
Effective financial inclusion	0.120 (0.04) ***	0.249 (0.14) *	0.311 (0.15) **	−0.036 (0.09)	−0.016 (0.01) **
Gross savings (% of GNI)	0.018 (0.04)	0.047 (0.19) *	0.203 (0.22)	−0.259 (0.12) **	0.013 (0.01)
Domestic credit to PS	−0.006 (0.01)	−0.046 (0.05)	−0.186 (0.05) ***	−0.005 (0.03)	0.007 (0.00) ***
Government spending	0.078 (0.32)		1.203 (1.57)	−0.209 (0.86)	0.852 (0.07) ***
Education expenditure		3.743 (1.36) ***			
Labor force participation	−0.056 (0.04)		−0.195 (0.21)	0.485 (0.11) ***	0.007 (0.01)
Agriculture value added				−0.317 (0.15) **	−0.064 (0.07)
New business density	0.015 (0.02)				
Low-income	−0.203 (0.02) ***	−0.401 (0.10) ***	0.234 (0.11) **	0.311 (0.07) ***	0.035 (0.01) ***
Lower middle-income	−0.111 (0.02) ***	−0.148 (0.09) *	0.124 (0.10)	0.084 (0.05)	0.022 (0.00) ***
Upper middle-income	−0.053 (0.02) ***	−0.042 (0.07)	0.056 (0.08)	0.039 (0.04)	0.012 (0.00) ***
Constant	0.952 (0.07) ***	0.649 (0.15) ***	−0.015 (0.38)	−0.122 (0.20)	−0.058 (0.02) **
R-squared	0.8729	0.5717	0.2073	0.6498	0.6969
Wald p-value	0.0000	0.0000	0.0015	0.0000	0.0000
Anderson-Rubin p-value	0.1002	0.1038	0.2333	0.0067	0.4570
Basmann p-value	0.1399	0.1497	0.2980	0.0186	0.5253
Number of observations	96	96	96	96	96

This table reports coefficients (standard errors in parentheses) of Limited Information Maximum Likelihood (LIML) estimation of the equation $Welfare_i = \gamma_0 + \gamma_1 EFI_i + \Gamma' Controls_i + \epsilon_i$ using 2017 Findex data of 96 developing countries. The dependent variables are listed in the top row. The instrument variables used in the regressions include gross loan portfolio of microfinance institutions (MFIs) as a proportion of number of branches, index of contract enforcement, difference in index of effective financial inclusion (2017 minus 2014), and index of ethnic fractionalization.

Table 12
Estimates of successful financial inclusion – robustness to small samples and clustering of standard errors.

Dependent variables	GDP per capita (PPP adjusted)	Secondary school enrolment	Self-employment	Poverty headcount (below $1.90)	Undernourished population
Effective financial inclusion	0.120 (0.05) **	0.249 (0.15) *	0.311 (0.15) **	−0.036 (0.10)	−0.016 (0.01) **
Gross savings (% of GNI)	0.018 (0.04)	−0.047 (0.21)	0.204 (0.24)	−0.259 (0.15) *	0.013 (0.06) ***
Domestic credit to PS	−0.006 (0.01)	−0.046 (0.05)	−0.186 (0.05) ***	−0.005 (0.03)	0.007 (0.00) ***
Government spending	0.078 (0.37)		1.203 (1.61)	−0.209 (0.84)	0.852 (0.06) ***
Education expenditure		3.743 (1.71) **			
Labor force participation	−0.056 (0.04)		−0.196 (0.20)	0.485 (0.14) ***	0.007 (0.01)
Agricultural value added				−0.317 (0.16) **	−0.064 (0.06)
New business density	0.015 (0.02)				
Low-income	−0.203 (0.02) ***	−0.400 (0.11) ***	0.234 (0.12) *	0.311 (0.06) ***	0.035 (0.01) ***
Lower middle-income	−0.111 (0.02) ***	−0.148 (0.10)	0.124 (0.09)	0.084 (0.05) *	0.022 (0.00) ***
Upper middle-income	−0.053 (0.02) ***	−0.042 (0.06)	−0.056 (0.09)	0.039 (0.03)	0.012 (0.01) ***
Constant	0.952 (0.08) ***	0.649 (0.17) ***	−0.015 (0.41)	−0.122 (0.16)	−0.058 (0.02) **
Adjusted R-squared	0.8596	0.5376	0.1344	0.6131	0.6652
Wald p-value	0.0000	0.0000	0.0044	0.0000	0.0000
Anderson-Rubin p-value	0.1002	0.1038	0.2333	0.0067	0.4570
Basmann p-value	0.1399	0.1497	0.2980	0.0186	0.5253
Number of observations	96	96	96	96	96

This table reports coefficients of Limited Information Maximum Likelihood (LIML) estimation of the equation $Welfare_i = \gamma_0 + \gamma_1 EFI_i + \Gamma' Controls_i + \epsilon_i$ using 2017 Findex data of 96 developing countries. Dependent variables are listed in the top row. Robust standard errors (in parentheses) are clustered by country and adjusted for small sample size. The instrument variables used in the regressions include gross loan portfolio of microfinance institutions as a proportion of number of branches, index of contract enforcement, index of ethnic fractionalization, and difference (2017 minus 2014) in the index of effective financial inclusion.

general poverty. Furthermore, people living in low-income countries have a higher propensity for self-employment, perhaps because of the weak capacity of their economies to create meaningful job opportunities for them than is the case in higher income countries. The good news from our findings is that the adverse effects of aggregate income on welfare diminish as income levels improve (i.e., as reflected in the progressively lower magnitudes of coefficient estimates).

7. Summary and concluding remarks

This work was motivated by the need to seek out ways by which to harness the benefits of the financial inclusion paradigm more productively. This paradigm has now become acknowledged as a creditable development model, especially in developing and emerging market economies. Up until our paper, most of the existing works on financial inclusion had focused predominantly on calibrating inclusion levels, access to inclusive finance, identifying beneficiaries of the paradigm, how the ICT platforms support financial inclusion, and the need for regulating this market segment. We saw these as relatively disparate aspects of the financial inclusion narrative. Consequently, it became important for us to consider all these issues holistically, and accordingly organize our understanding of the paradigm in a way that can guide policymakers, at national levels, on how to leverage the paradigm more productively for its much-touted economic welfare enhancement effects.

Our work, therefore, focused on this overarching objective (imperative) by: 1) defining financial inclusion along the lines of identifiable population groups that have been and are typically financially excluded by mainstream financial services firms; 2) highlighting, for the first time, that an increased national savings pool is a crucial prerequisite for a sustainable (effective) financial inclusion; and 3) positing that a combination of aggregate savings and prevalence of non-traditional financial intermediaries would jointly explain effective financial inclusion. Moreover, and in line with theoretical expectations, we also posited that effective financial inclusion would, in turn, enhance economic welfare (i.e., yield successful financial inclusion), whilst also interrogating which of the suspected antecedents are more important in fostering the ultimate welfare effects of the financial inclusion paradigm.

Interestingly, we documented results that support our hypothesis that, indeed, a large savings pool is the necessary "horse" to pull the "cart" (of financial inclusion). In other words, where effective financial inclusion and its associated consumption smoothing and incremental production (i.e., economic welfare enhancement) occurred, larger pools of savings were consistently present. In fact, within extant literature, our work and its findings can be contextualized as follows. First, in our mission to flag the necessity for sustainability/effectiveness of the financial inclusion paradigm, we need to firstly consider its key antecedent (i.e., large savings pool). And to ascertain the validity of this key postulation about the paramountcy of savings, we, for the first time, defined a set of financial inclusion constructs that directly capture or reflect the inclusion of specific groups that have been copiously identified as being financially excluded – e.g., the unemployed, much of the female population, the poor, and rural dwellers in our sample countries. Second, not only did we document results that are robustly consistent with this key hypothesis, but we also found additional nuanced and insightfully supporting relationships.

For example, our multidimensional construct of "effective financial inclusion" impressively correlates with important macroeconomic performance indicators, including GDP per capita, level of financial development, and number of accounts in financial institutions (which has often been used as a proxy for financial inclusion level by past studies). Importantly, our construct neatly ranked the 96 developing countries in our sample from the most to the least financially inclusive, with East Asia & Pacific countries featuring among the top-10 most inclusive countries, followed by East & Central Asian countries, and the Middle East & North African countries, whilst Sub-Saharan African and South Asian countries dominated the least financially inclusive countries. Though these rankings have high within regional bloc variability, the regional ranking remains unchanged upon ranking them by median "effective financial inclusion" index: East Asia & the Pacific (1st), East & Central Asia (2nd), Middle East & North Africa, Latin America & the Caribbean, South Asia, and Sub-Saharan Africa, follow in that order.

Third, our regression on quantiles of the re-centered financial inclusion influence function shows an increasing influence of *aggregate savings* and relative presence of *non-traditional financial institutions* on financial inclusion. More specifically, this positive impact is pronounced for some specific target financial inclusion sub-groups, such as "poorest 40% of the population" and "rural dwellers", as well as for a broader effective financial inclusion index, which, in addition to the overall financial inclusion index, includes "individuals with primary school education or lower" and "young adults". On the independent supporting

effects of non-traditional financial institutions (e.g., MFIs) on financial inclusion, it is particularly strong among "rural dwellers" and "females"; both of which represent some of the most typically excluded constituencies due partly to cultural factors (gender issues) and remoteness of location of residence which makes it expensive to provide financial services through traditional physical branch networks (rural dwellers). Therefore, our results provide strong evidence that a growing pool of aggregate savings and an increment in supportive non-traditional financial institutions, have higher marginal effects on impactful financial inclusion in developing countries – thus, supporting what we, more broadly, in this paper, term "effective financial inclusion".

Fourth, we further postulated that if "effective financial inclusion" indeed exists in the manner we have defined it, then that effectiveness would be reflected by way of enhanced economic welfare. Such an outcome is what we, in turn, termed "successful financial inclusion". In fact, our results on this "ultimate effect of financial inclusion test" show that our financial inclusion constructs report coefficient signs that are consistent with theoretical expectations. For example, a 10 % increase in effective financial inclusion increases secondary school enrollment (a welfare indicator) by 2.5 % and causes a decline of 0.16 % in the proportion of the population that is undernourished. Even more telling is our result on GDP per capita, which showed that an increase in effective financial inclusion would elicit a highly positive impact on "economic development" of the emerging economies in our sample. More interestingly, we provide direct evidence that people living in lower-income countries are more vulnerable to poor welfare, such as inability to enroll their children in secondary schools, undernourishment, and general poverty. Furthermore, people living in lower-income countries have a higher propensity for self-employment, perhaps because of the weak capacity of their economies to create meaningful job opportunities for them than is the case elsewhere.

Fifth and finally, a summative take-away from our work can be said to be a clear and systematic policy guide on how governments interested in economic growth and development can effectively leverage the financial inclusion paradigm. That is, by first understanding the target population the development paradigm seeks to uplift, the major drivers of the paradigm (coexistence of large savings pool and prevalence of non-traditional financial institutions), and how to assess the paradigm's eventual success. Interestingly, we note that among the target population groups that the financial inclusion paradigm would uplift the most if strategically targeted, are "rural dwellers", "females" and "the quite poor", in that order.

Overall, this work has markedly advanced our knowledge of the financial inclusion paradigm by the clear instructive findings it has documented, as well as provided a basis for potential future richer insights, as more relevant panel data become available.

Appendix A. Appendix

Table A1
Countries included in this study.

Afghanistan	Costa Rica	Kuwait†	Russia
Albania	Cote d'Ivoire	Kyrgyz Republic	Rwanda†
Algeria	Croatia	Lebanon	Saudi Arabia
Argentina	Dominican Republic	Madagascar	Senegal
Armenia	Ecuador	Malawi	Serbia
Azerbaijan	Egypt	Malaysia	Sierra Leone
Bahrain†	El Salvador	Mali	South Africa
Bangladesh	Ethiopia	Mauritania	Sri Lanka
Belarus†	Gabon	Mauritius	Tajikistan
Benin	Georgia	Mexico	Tanzania
Bolivia	Ghana	Moldova	Thailand
Bosnia & Herzegovina	Guatemala	Mongolia	Togo
Botswana	Guinea	Montenegro†	Tunisia
Brazil	Haiti†	Myanmar	Turkey
Bulgaria	Honduras	Namibia	Uganda
Burkina Faso	India	Nepal	Ukraine
Cambodia	Indonesia	Nicaragua	United Arab Emirates
Cameroon	Iran	Niger	Uruguay
Chad	Iraq	Nigeria	Uzbekistan
Chile	Jordan	Pakistan	Venezuela
China	Kazakhstan	Panama	Vietnam
Colombia	Kenya	Peru	West Bank & Gaza
Congo, Dem. Republic	Korea, Republic	Philippines	Zambia
Congo, Republic	Kosovo	Romania	Zimbabwe

† Data available for 2017 only.

Table A2
Descriptive statistics for 2017.

Variable	#Obs.	Mean	SD	Min	Max
Financial inclusion metrics					
Effective financial inclusion index	96	0.5301	0.2873	0.1056	1.4796
Effective financial inclusion index, Alternate	96	0.5203	0.2733	0.1052	1.3882
Sub-index: out of labor force	96	0.4753	0.2661	0.0452	1.4039
Sub-index: female	96	0.5804	0.3157	0.0704	1.6158
Sub-index: young adults	96	0.4859	0.2882	0.1181	1.3940
Sub-index: rural	96	0.5852	0.2979	0.1539	1.5111
Key explanatory variables					

(continued on next page)

Table A2 (*continued*)

Variable	#Obs.	Mean	SD	Min	Max
Aggregate savings (domestic savings, % of GDP)	96	0.2191	0.1003	0.0261	0.4660
Financial development, institutional quality, and infrastructure					
Financial institutions development (IMF index)	96	0.3814	0.1573	0.1003	0.8185
Capital market liquidity (broad money, % of GDP)	96	0.6159	0.4542	0.1267	2.5883
Governance index	96	−0.4003	0.5883	−1.8239	0.9404
Bank concentration (3 banks)	96	0.5788	0.1570	0.1705	0.9267
Financial inclusion-enabling infrastructure (index)	96	0.2741	0.1280	0.0604	0.6995
Mobile cellular subscriptions (per 100 people)	96	1.0870	0.3402	0.3414	2.0898
Fixed telephone subscriptions (per 100 people)	96	0.1095	0.1091	0.0007	0.4232
Individuals using the Internet (% of population)	96	0.4680	0.2522	0.0650	0.9800
Individual/household level antecedents					
Financial inclusion-enabling receipts (index)	96	0.7177	0.2963	0.2037	1.3757
Received wages	96	0.4726	0.2279	0.0455	0.9369
Received domestic remittances	96	0.3610	0.1755	0.0677	0.7821
Received government transfers	96	0.5089	0.2764	0.1212	0.8694

This table shows summary statistics for the dependent variables and explanatory variables used in the study. "#Obs." is number of observations; "SD" is standard deviation; "Min" is minimum; and "Max" is maximum; GDP is gross domestic product; NTFI is non-traditional financial intermediaries; IMF is International Monetary Fund. Data are for 2017.

Table A3
Correlations between pairs of explanatory variables, 2017.

Variables		1	2	3	4	5	6	7	8
1	Domestic savings (% of GDP)	1.000							
2	Prevalence of NBFI	0.090	1.000						
3	Financial development index	0.160	−0.204	1.000					
4	Financial institutions index	0.048	−0.184	0.853	1.000				
5	Broad money (% of GDP)	0.107	−0.146	0.454	0.425	1.000			
6	Governance index	0.155	−0.098	0.585	0.580	0.161	1.000		
7	FI enabling infrastructure index	0.059	−0.248	0.603	0.616	0.177	0.632	1.000	
8	FI enabling transactions index	−0.034	−0.131	0.595	0.608	0.158	0.511	0.693	1.000

Data availability

Data will be made available on request.

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