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Inclusive Stability: Financial Inclusion and Stability

A quantitative study on financial inclusion's association and effect on financial stability in Sub-Saharan Africa.

by

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Abstract

This paper examines the relationship between financial inclusion and financial stability using panel data analysis with fixed effects estimations alongside an instrumental variable approach to reveal causal links. The study focuses on 18 Sub-Saharan African countries whose financial inclusivity has in some form been affected and driven by mobile money technology, and is captured from the years 2004-2024. The study reveals mixed evidence, with correlation between the two variables being negative, but the causal model suggesting a strongly positive yet questionable effect. Through elaboration and inclusion of existing literature, it is shown that financial inclusion can pose threats of adverse risk selection, but also risk-diversification for financial institutions. While financial inclusion remains important for economic development, the results highlight the need for balanced financial policies and effective oversight to reduce potential systemic risks.

Key Words: Financial inclusion, Financial Stability, Mobile Money, Sub-Saharan Africa

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1. Introduction

Financial inclusion has become a central pillar of development policy, especially in Sub-Saharan Africa (SSA), where limited access to formal financial services has historically been a hurdle to achieving economic participation and development. A large share of the population has historically operated outside any form of formal banking system, relying instead on informal savings or cash-based transactions. Something which often limits opportunities for investment, reduces welfare, and resilience to economic shocks. Expanding access to affordable and reliable financial services is therefore seen as essential for reducing poverty, stimulating financial activity, and promoting inclusive development across the region. In recent years, the rapid expansion of mobile money, led by services such as M-Pesa, has fundamentally transformed the financial landscape. By implementation of it alongside widespread mobile phone usage, these platforms have enabled millions of previously unbanked individuals to access these types of activities. This technological shift has significantly lowered people's barriers to entry, especially in rural areas and regions that were underdeveloped where traditional banking infrastructure would turn up scarcely. As a result, mobile money is not only a tool to increase financial access but it has also reshaped how individuals and small businesses engage with financial activities. While this transformation is often associated with positive outcomes such as poverty reduction and economic growth, its implications for financial stability remain less understood in existing literature. On the one hand, greater financial inclusion may contribute to stability by broadening and diversifying the deposit base, improving risk-sharing, and enhancing households' ability to absorb shocks. A more inclusive financial system can reduce reliance on volatile funding sources and strengthen the overall resilience of the economy. On the other hand, the rapid scaling of mobile money and the expansion of financial accessibility may also introduce new risks. These include potential regulatory and operational weaknesses, as well as the introduction of riskier parts of the population to banking activities. Due to this, the relationship between financial inclusion and financial stability is complex, highlighting the need for a more nuanced understanding of how innovations in financial access interact with the whole of a financial system. This paper does exactly this and examines whether, and how financial inclusion,

particularly in the context of mobile money adoption, affects financial stability in Sub-Saharan African countries.

1.1 Aim, Scope and Research Question

The aim of this study is to analyse the relationship between financial inclusion and financial and financial stability in Sub-Saharan Africa. Especially in those countries who are heavily involved and active within the mobile money market which is a large actor in many SSA countries' economies. Additionally, if there is a relationship to be found between these two, I will try to find if there are causal effects in the direction towards stability. The research question in mind thus formulates as:

Does financial inclusion affect financial stability in mobile money influenced countries in Sub-Saharan Africa?

And following the arguments based on existing research and financial assumptions, the hypothesis for the research is formulated as follows:

The increased financial inclusion in Sub-Saharan African countries leads to a riskier part of the population entering into formal banking contracts which leads to increased financial instability.

The lack of previous research concerning the rise of financial inclusion in SSA countries opens up for this paper in a few ways. First of all is the observation on whether there is a correlation between financial inclusion and stability within banking and financial frameworks. Second, if the hypothesis holds true that increases in financial inclusion actually negatively affects stability it can prove to be a stepping stone towards finding new solutions in incorporating inclusion into a more sustainable development agenda.

1.2 Outline

The paper is structured as follows. The first section introduces the research question, the aim and scope of the study. Second comes the background which explains some of the core concepts used in the paper, such as financial inclusion, banking stability, as well as an overview of fintech in Sub-Saharan Africa. Third is the literature review which compares and discusses different types of literature connected to the topic which could help nuance and further explain previous findings in similar studies. The literature review also helps to form a research hypothesis that is presented in the first section. In the fourth section the data and variables used for the study in the paper will be presented, and the fifth section will explain the methodology connected to the data. In the following sixth section is where the results of the study will be presented and additionally a part on discussing the relevant answers and results received. The seventh and final section will include concluding remarks, tying together and comparing to previous research, but also incorporating suggestions on how upcoming research could help improve and broaden the knowledge within the field of financial inclusion and stability. After this follows a reference list and an appendix.

2. Background

2.1. Financial Inclusion

Affordable access to financial tools and services, payments and savings in its most basic form, plays a key role in driving economic development and reducing poverty. In developing economies such as parts of the SSA, financial inclusion strengthens resilience, as the World Bank (2026) suggests that 80 percent of adults with savings are better equipped to manage economic shocks, of which some of that might arise from financial instability. A larger accessibility to means of payments and reducing the hurdles to transactions can both benefit consumers and firms and stimulate economies. For instance, Mitchell and Scott (2019) showed that increases in financial inclusion led to drawing more people into the formal banking system which made people use more credit and debit cards for transactions. This ultimately led to more consumption which for the tax agency, resulted in more easily being able to track transactions, thus, being able to cover more taxes.

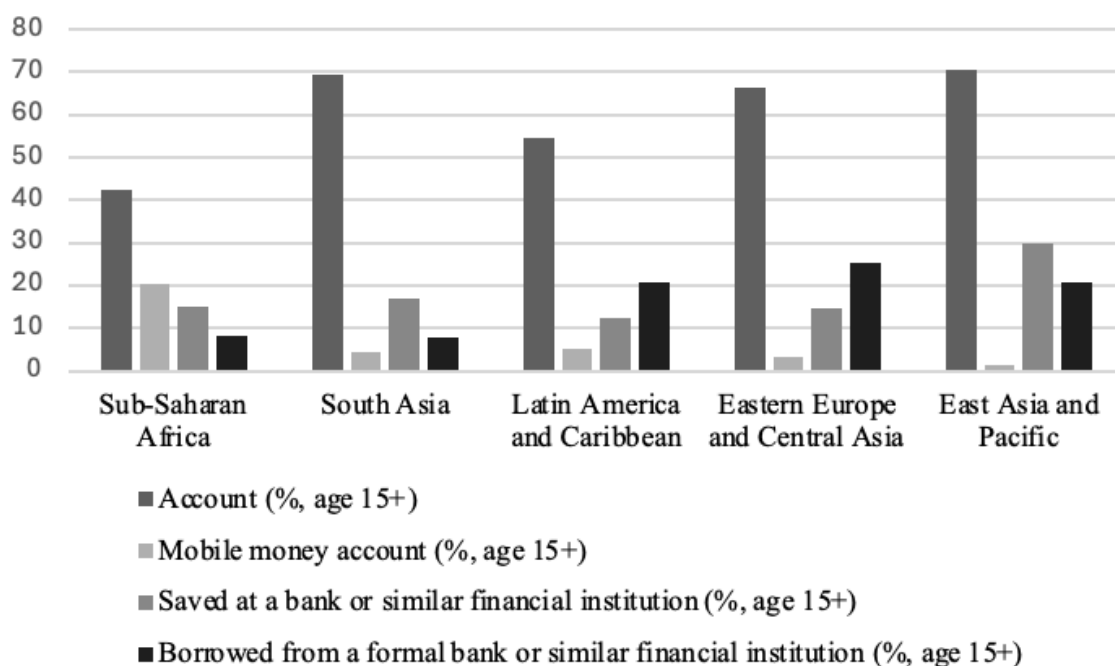


Figure 1 - Regional differences in aspects of financial inclusion

Source: Adapted from World Bank, 2025, Global Findex Database 2025.

Along the lines of points forwarded earlier by Dwumfour (2017) on foreign banks, authors Beck, Senbet, and Simbanegavi (2014) also touch on this topic in the region of SSA, although from the angle of financial inclusion. Much like in terms of banking stability, they find that U.S. and European banks' entrance to African markets did not help improve financial accessibility, whereas banks from emerging markets drastically did so.

Some studies, mainly in developing Asian countries have noted that the discourse on the causes forget to include the fact that low human development as well as high illiteracy rates is a large factor in preventing vast parts of the populations from achieving growth in financial inclusion (Arora, 2012). But other notions as to why financial inclusion remains low in the developing world is access to local banks, ATMs, subsistence-level income, inequality, and high transaction costs (Bagli & Dutta, 2012). Nowhere is this as noticeable as in the case of SSA as seen in Figure 1, where the region ranks the lowest in terms of accessibility to accounts. Borrowing and

savings are as well in the lower ends, and the only factor where SSA proves its strength is in mobile money access.

Kodongo (2018) showed that certain SSA countries, with Kenya in the lead, actively tried to increase its promotion of financial inclusion for the past decade. With financial education becoming a key to policymakers aim at increasing this. To do so, Nelson and Wambugu (2008) argued four channels to be targeted which were face-to-face interactions, mass media, improvements in formal education systems and further regulatory measures.

2.2. Financial Stability

Financial crises are one of the most common fears for policymakers with regards to finances within their own countries, as well as globally. They repeatedly disrupt national economies and financial systems, often following patterns such as excessive leverage and weak liquidity, even though thorough considerations and precautions in forms of regulations are designed to prevent such vulnerabilities. Despite being on the top of every agenda since the great depression one hundred years ago and a variety of possible measures to avoid it has been taken, they still show up from time to time. And in the words of Barth and Schreft: “...new crises generally differ in critical ways from those that preceded it; if they did not, the existing regulatory and supervisory regime would have kept any financial system disruptions from developing into financial crises” (2025, p.2). A term they like to use and attribute to the author Taleb (2010) is that of a “black swan” as they are events that are so rare and unlikely, yet extremely devastating. But then what defines financial crises? Garry J. Schinasi brought forward a definition compounded by other definitions used by some of the largest financial institutions and actors and came up with:

A financial system is in a range of stability whenever it is capable of facilitating (rather than impeding) the performance of an economy, and of dissipating financial imbalances that arise endogenously or as a result of significant adverse and unanticipated events (Schinasi, 2004, p.8)

When the large financial crises occurred in mid-2007, many people thought that SSA would be minimally affected as reported by Allen and Giovannetti (2011). With limited financial

integrations, both regarding their own populations which were to large extents in the informal sector, but also on global levels. And the authors even state that some argued this was the time to invest in the region due to its low levels of shown effects. But as later evidence showed, remittances decreased drastically as well as the financial effects spilling over to trade, which ultimately hurt the countries in the region, especially export-oriented economies on the continent. The low interest-rate policies implemented prior to the crash which ultimately led to the collapse was not in its early stages directly connected to the African economies and their banking structures. Whereas other countries outside of the US, mainly in Europe, were hit with similar measures and effects on house prices and stock markets were significant and well documented.

As Goodhart et al. (2006) was early to point out, the fields of financial fragilities are hard to fully grasp and even more difficult to address in mathematical formulations. This leads to several difficulties in illuminating the problems and causes of financial and banking stability, at least in simple and informative ways. But one point the authors press on is the key to adhere to heterogeneity. In analysing the banking sector the idea is thus that banks are not all the same, but instead differ in important ways that affect how they behave and respond to various economic conditions. Rather than assuming a single modeled bank, the authors emphasise that banks vary in size, business models, risk preferences, and funding structures for instance. Some banks may focus on traditional retail lending and rely heavily on deposits, while others may engage more in investments, and these differences shape how they act and react to changes in monetary policy or times of extra financial fragility. This heterogeneity thus matters because it means that economic policies and shocks do not affect all banks the same. For example, a change in interest rates may influence a large and internationally active bank in a different manner than a small, local one.

2.2.1. Efforts of Enhancing Financial Stability in SSA

Whereas many developed countries have focused on increasing their stability within financial and banking institutions and markets as a whole since the 2007-2008 financial crises, African countries have during the same time relied more on increasing accessibility to financial systems as reported by Beck et al. (2010). Much of the increase in financial inclusion has naturally spilled over to the region as a response to larger global liquidity. Yet, this has not automatically meant

increases in actively preventing potential crises. As many other regions in the world, SSA also possesses a few larger financial powerhouses in certain areas, whereas less financial focus is to be seen in other areas. One of those, which Beck et al (2010) writes extensively about is Kenya, and more specifically Nairobi which at least on the eastern part of the continent has grown to be the workhorse of financial markets and institutions. And in the context of SSA, is often hailed as a prominent example of a large, diversified, and well maintained financial hub. Private credit to GDP median for instance was in 2008 double that of the remaining SSA (23.7 % in Kenya; 12.3 % in SSA). But in terms of stability, people are still unsure how strong their safety nets and routines really are. Beck et al. pointed out a few measures that were made right before the financial crisis of 2007-2008 that aimed at reducing the fragility of the system, mostly stemming from policy and regulatory changes. Yet the distribution of the financial market remained largely skewed, with much of the savings coming from small households, but made towards separate banks that all had different niches, whereas the majority of all lending in the country came from the largest firms and enterprises. The individual banks thus never really succeeded in diversifying its risk sharing, despite the country as a whole having a largely diversified financial system. If we go back even further, the authors showed that maybe the largest efforts were made after the 1985-1986 crisis where the government established a Deposit Protection Fund Board which aimed solely at managing and overseeing insurance payments of failed deposits. Despite becoming a leading institution towards stability, critical voices during this period were raised due to the board's closely tied relationship with the Central Bank of Kenya. With much of the staff and administrative frameworks being active in both entities. And As the Central Bank's vision was first and foremost as previously mentioned to further accessibility, there could from time to time arise conflicts of interest, from what were in large the same personnel.

Other countries, such as South Africa, adapted a more clear cut two-agency approach. And especially after the 2007-2008 crisis where they incorporated a so-called twin-peaks approach as stated by Nier (2010). In this approach, he created an institutional structure made up from two pillars: First a systematic risk calculator, which was in the hand of the central bank, and secondly a business conduct regulator which laid out the frameworks and regulations. In this instance, the central bank had much of the focus on risk calculation and less on actual policy decisions, as a contrast to the Kenyan case.

Between 2008 and 2010, bank's weighted average Z-score were relatively close to the region's average in Kenya and South Africa, although on the somewhat higher end of that interval with 19.2 for Kenya, and 27.1 for South Africa (Moyo et al. 2014) If we instead look away from the large financial powerhouses, we can also see some interesting developments. Due to the relatively stable financial climate, indicated for instance by some respectable z-score values, countries surrounding Kenya and South Africa saw it fitting to sacrifice some of these values to implement financial liberalisation as reported by Moyo et al. (2014) With some countries, such as Zambia making this transition far too quickly alongside what the authors argue was a poorly educated workforce, at least in financial regards. More care was taken in other countries, focusing on a more gradual and steady shift from stability to liberalisation. Examples the authors bring up here is Ethiopia and Ghana, who still had a large focus on financial reliability, especially within public sector banks. Despite the precautions, scholars still criticise their steps and note that the liberalization aims have not been as successful as one hoped. The aim of combining stabilization and liberalization led by public sector bank investments has instead had reversed effects on privately owned banks (Worku, 2011; Moyo et al. 2014).

In more recent years, other SSA countries have gone for more traditional approaches as seen during some regulatory periods in Europe and the US with the Basel III for instance. With Ghana extending their minimum capital requirement with 230 percent (Yakubu & Bunyaminu, 2021). Despite the discourse on soundness and stability varying between scholars and their opinions on the regions change and contradict each other, some facts point towards an enhanced stability, at least in some terms. If we look at the share of non-performing loans as a share of total loans in 2004 and 2013, the SSA average has gone down substantially by almost half. Going from 12 percent, down to around 6. With Kenya (29 to 5) and Rwanda (31 to 7) representing some of the largest decreases (Mecagni et al. 2015).

2.3. Mobile Money

Although the authors Wang and Lou (2022) do not incorporate Sub-Saharan African countries into their study, thus not showing any potential diversion between the developed world and the developing continent of Africa. One important distinction to make in their paper as opposed to

this one is the use of mobile money. In their paper, much of the emphasis on financial inclusion lays on accessibility to physical money such as ATMs and also interactions with local banks. In many of their countries this is a viable alternative since they incorporate countries with established banking culture and structure, with online platforms that are used for saving and investing. SSA on the other hand relies heavily on mobile money in order to facilitate the large amount of growth in financial inclusion as reported by Willige (2023) at the World Economic Forum. Out of the 1.6 billion registered mobile money accounts in 2022, Willige estimates that 763 million of those are in SSA. And in terms of the 1.26 trillion USD in transaction value for the same year, SSA accounted for 832 billion USD according to the same source. A region with such a vastly different constructed system of their financial inclusion as opposed to the countries in Wang and Lou's (2022) paper also increases the need for a different measurement of this region and its specific traits.

Since Beck et al. (2010) wrote their paper, financial accessibility has taken major leaps in the country not least due to financial technologies. And much so in the rest of the continent as well as seen in figure 1. Fundamental to the rapid growth of financial inclusion in the developing part of the world, and most notably in SSA, mobile money and other digital financial services that has been enabled by recent developments in fintech has rapidly engaged new parts of the population in financial activities (World Bank 2026). Mobile money is a system in which regular people, most often customers, can transfer, and securely save money using their mobile phones (Hughes & Lonie, 2007). This specific part of Fintech is most prevalent in parts of SSA which has invested heavily in becoming global leaders in the distribution of the technology and has proven valuable in these, as well as other parts of the world for its easy use and safe way of storing money, without the need of physical money in what can be some neighbourhoods and regions otherwise prone to thefts and robberies. One of the countries in this region, namely Kenya, has taken the forefront in this technology with its implementation of M-Pesa, the largest in the region. The service started in 2007 by Safaricom and works in a closed loop system where people need to buy their e-currency from so-called M-Pesa agents situated all over the country (Hughes & Lonie, 2007).

3. Literature Review

Three theoretical frameworks could help support possible links between stability and inclusion in a financial setting. These are theories of financial intermediation, Minsky's theory of financial instability, and a theory of financial liberalization. In this section, previous literature will be gathered and analysed in order to complement the quantitative research conducted in this paper. Additionally, existing literature has helped formulate the hypotheses as well as laying the groundwork for understanding the current state of these two terms. Furthermore, focusing on the aspect of mobile money will give an updated understanding of financial inclusion in the SSA setting where it is of key importance in its evolution.

3.1 Financial Inclusion's Effect on Financial Stability

This study builds on, and reapplies parts of a study from Wang and Lou (2022) into a new setting. The Wang and Lou paper measured financial inclusion and its effects on financial soundness in some emerging and middle-income countries. In their paper, they included samples from Latin America, Eastern Asia, as well as Central and Eastern Europe. The core principle and foundation of their study came from the rapid rise in financial inclusion in emerging economies, alongside an ever growing reliance on the banking system as a means for financial channeling. They mention that the size of the banking system relative to the capital market was 81.9 back in 2012 in the emerging economies, whereas in the advanced economies, this number was down at 3.7. Despite the massive power from the banking system in these parts of the world, they show by numbers from Laeven and Valencia (2013) that their banking systems fare far worse in times of crises and despair. With not only the effects being significantly higher, but Laeven and Valencia also suggest that the frequency of such negative outcomes are far greater than in the advanced world. Suggesting the vulnerability of banking institutions are significantly worse in countries with larger dependencies on banking systems. Wang and Lou (2022) draw a couple of different conclusions from their research. The positive effects of financial inclusiveness and banking stability are showing, yet in specific scenarios. For example, an enhanced investment environment was found to statistically significantly decrease soundness within the financial sector. Something that very well could be attributed to letting riskier individuals into the market of investments. Gosh (2022) on the other hand provides evidence showing that account

ownership and savings increases actually help improve stability and soundness, contrasting to the view that increased participation in savings and investments lead to less stability.

As in many other parts of society, institutional quality is a major point in preserving banking stability in SSA. With author Peterson K. Ozili (2018) suggesting through his research that factors such as “...banking efficiency, foreign bank presence, banking concentration, size of banking sector, government effectiveness, political stability, RQ, investor protection, corruption control and unemployment levels are significant determinants of banking stability in Africa...” (2018, p.477). Extending further into the point of this study, Ozili additionally suggests that future research should include considerations of digital finance as a possible actor in the level of stability. Which thus became one of the motivations for writing this paper.

Whereas Ozili (2018) mentions banking concentration as a possible determinant of financial stability, Dwumfour (2017) took that one step further, by trying to analyze the exact effect and outcome. He showed results that were rather ambiguous, suggesting that less competition, and larger banks with a varied portfolio and well executed regulations could actually be preferred in some scenarios of crises. Although a too concentrated market, especially with poor management and lack of proper regulations can also reduce stability. SSA has historically had a very high banking concentration (Beck et al. 2006). But in later times Dwumfour (2017) presented numbers suggesting that there is a declining trend in banking concentration within the region. But with the notion that some of these are foreign which if taking over too much, is just as, or even more devastating for stability. Only creating real value when entering during a period of crises as the inflow of capital could help stabilize a rough period he continues. One argument as to why foreign banks entering the domestic market could prove harmful is that “foreign banks may be bad at evaluating borrowers in local market...” (Dwumfour, 2017, p.272). Outside of SSA, the results lean more towards a concentration–stability view, indicating that banking crises are less likely to occur in concentrated banking systems (Beck et al. 2006; Allen & Gale, 2000).

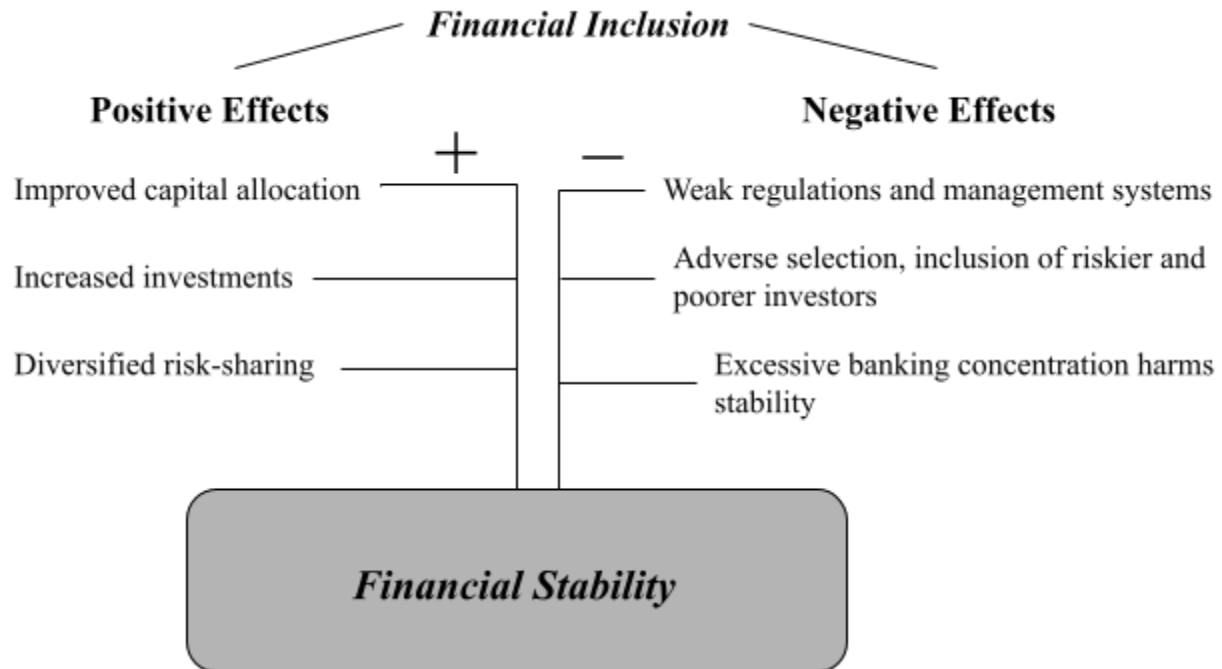


Figure 2 - Channels of financial inclusions effect on financial stability

Source: Author's calculations.

Not only does the effect of banking concentration matter in terms of their quantity, but a large focus lies as well in the interconnectedness of these banks. Miguel A. Segoviano and Charles Goodhart (2009) studied the distress dependence amongst banks and its effect on stability within the financial ecosystem. The affection of inter-bank deposit markets or through lending to similar sectors and companies makes these shocks spread throughout the banking system. Despite being a valuable insight and a point to make in the analysis of economic distress and banking stability, the two authors expressed the difficulty of quantifying the distress dependence. Yet they still managed to contribute to the literature on European banks. African cases, on the other hand, have remained relatively understudied. For instance, with a mobile money service like M-Pesa so heavily linked to one specific bank could in theory change the effects of the distress dependence within banking stability.

Figure 2 presents the summarised picture of earlier research brought forward that suggests causal links between the two terms. Financial inclusion helps improve capital allocation, enabling more

efficient allocation of funding as well as easing up access to finance. It thus also increases investments, which contribute and culminate in diversified risk-sharing, which enables more resilient economies and financial systems. On the other hand, the larger and more concentrated markets that might arise from the dominant forces of services that enhance financial inclusion can also act with negative impacts on financial stability (Ozili, 2018; Dwumfour, 2017). Mostly, concerns have been raised that adverse selection kicks off in strong forces when it comes to this relationship. As broader inclusions of investors, both on firm and individual levels, could drastically include risk-takers that do not have the finances to account for losses. Thus increasing risks of instability within a particular country's financial systems (Wang & Lou, 2022).

3.2 Financial Stability's Effect on Financial Inclusions

Additionally to the idea of financial inclusion's effects on stability, one has to be aware that a reverse causality can be prevalent as well. A reverse causality scenario of this manner occurs according to Cihák et al. (2021) when a crisis occurs, or the financial landscape gets rubbed, banks cut their lending and interactions to smaller players on the market, such as small firms and poorer households. Minimizing focus on financial inclusion or actively swaying away from these actors can thus result in a reverse causality. This follows the line of the financial instability hypothesis developed by Hyman Minsky (1992) which explains why financial systems are inherently prone to cycles of stability and crisis. The central argument of this theory is that periods of economic stability can actually sow the seeds of future instability, and vice versa. So easing up financial restrictions can both promote growth but also result in increased instability, as also more people are drawn into the financial system. Extending their argument, Cihák et al. (2021) additionally mention the notion that strong economic growth can be an exogenous factor which increases both demand for financial services, but also helps improve bank stability. Thus, a direct causal relationship between the two original terms could be decreased, and might even not exist.

Differing from this paper, which aims at studying a one way causal relationship, previous literature emphasise the bi-causal relationship between inclusion and stability. But Much like this paper, the earlier mentioned Wang and Lou (2022) paper also seeked one way casual evidence. Although, Cihák et al. (2021) mention that even if this works, one has to be very clear and

evident of what exact measurement and tools are used, as they can vary slightly between one another.

As this paper concerns the effects of financial inclusion, both good and bad, it is of large interest to analyze previous criticism of increased financial inclusion. Just as Ozili points out: “The literature is silent on the risks associated with greater financial inclusion. The people, systems and structures that provide access to finance – for greater financial inclusion – carry some element of risk.” (2020, p.471). Amongst the concerns which Ozili brings forward is the argument of the alternative cost of other projects when nationalising promotions of financial inclusion as well as the encapsulation of “risky” parts of the population into the banked population, both of which have received scarce attention in the discourse amongst scholars.

3.3 Mobile Money

In Solow's (1956) neo-classical growth theory, long term economic growth comes from the basis of labor, physical capital, and technological change. With increases in efficiency of capital allocation stemming from financial technologies like mobile money for instance. The broadening of financial services like savings and capital accumulation, and extending these interactions to include the unbanked part of the population is thus an efficient way of establishing a foundation for sustainable growth. But technology such as this has also brought risks alongside its benefits. Dabrowski (2017) brings light upon some of these, with the increased entry and ease of running these services enabling greater competition on the market, could lead to banks searching for alternative routes for increased profitability. Such alternative ways could prove harmful in that it takes the shape of additional risk-taking. Alternatively, as the author also mentioned, is the worry that the financial sector gets much more dependent on the big tech companies enabling the supply of these services. Spillovers from big tech companies can thus flow straight on through to the financial market. Contrary to Dabrowski's belief, Tiriongo and Wamalwa (2020) found evidence that mobile money transactions and FinTech rather benefits individual banks in terms of their profit margins. When measuring return on assets and return on equity in Kenya, mobile money has instead enabled a safe and consistent way of supporting their net incomes. On the other hand, the two authors found evidence along the arguments of Mecagni et al. (2015) in that mobile money contributed to an increase in the ratio of non-performing loans in commercial

banks. The evidence goes both ways in FinTech's effects on financial stability and what weighs heavier is still hard to establish.

3.4. Contextual Factors

There is evidence from previous literature suggesting that the instruments are viable for use in this paper, where effects of both are seen in accounts of financial accessibility but not through any other channels up towards financial stability. Much of the previous literature has found strong evidence that communications technology has a strong positive impact on financial inclusion (Timedjeghdine & Djarmouni, 2025; Ergün, 2024; Tandon & Sood, 2023). Beck et al. (2007) found that communications infrastructure and technology significantly improve the outreach of banking services, and can thus through this channel, reduce delivery costs, and set up more robust systems that could possibly lead to increased financial stability. Similarly, authors Jain and Sahu (2023) find in their study a positive and statistically significant effect of communication technology on financial inclusion. ICT as their measurement tool, specifically internet accessibility and penetration, was found to be a strong driver of financial inclusion in middle-income countries. Further on, the two authors also drew from their study that financial inclusion positively affects financial stability, with the additional argument that this would be the channel from which increased levels of communication technologies end up affecting stability as well. Other scholars test the opposing view, Carbo-Valverde (2017) for instance suggests that stability concerns can arise from increases in financial technologies and the digital improvements. Yet, he does not provide any distinct channels and mechanisms through which this could act, and also suggests that the effect could be very minimal.

The other instrument Gender Inequality Index (GII) is argued by Wang and Lou (2022) to have strong effects on results of savings and credit interactions amongst populations. The gender gap in account ownership can significantly help explain different levels in financial accessibility (Demirgüç-Kunt & Singer, 2017). Certain studies provide arguments in favour of the view that gender inequality measures does affect financial stability (Perrin & Weill, 2022; Rakshit & Bardhan, 2023), but Ozili (2024) argues that although these effects exist, they flow through accessibility channels which shows up in our explanatory variable. Despite a few questions on

the validity of instruments, the ones used here, influenced by Wang and Lou's (2022) paper, receive significant backing from previous literature to assume robust and valid usage.

4. Data

The data that contribute to the foundation of the variables in this paper is merged from two datasets. One stems from the IMF's Financial Soundness indicator and the other one is the IMF's Financial Access Survey. The data comes in panel format and includes 18 countries, spanning from 2004 up until 2024. The decision to choose this time period was mainly due to data availability where much of the data could be reflected and analysed during these years. For the countries, (which are: Botswana; Burundi; Cameroon; Democratic Republic of the Congo; Republic of Congo; Ghana; Guinea; Kenya; Madagascar; Malawi; Mauritius; Namibia; Nigeria; Rwanda; South Africa; Tanzania; Uganda; and Zambia) the decision was based on the mobile money market which creates a unique template of analysing financial inclusion in the Sub-Saharan African region, influenced by the countries included in the study by Ahmad et al. (2020), although with a few exceptions due to mainly data availability. Additionally, a couple of key control variables are included whereby some external data sources will be included, something that is elaborated on in the section on control variables.

4.1. Variables

4.1.1. Financial Stability

Within recent studies, different scholars have used different metrics of stability within the financial structure. With bank Z-score being a popular alternative (Wang & Lou, 2022; Morgan & Pontines, 2014), whereas others have relied on separate measures such as the Financial Soundness Indicators from the IMF (Albulescu, 2015; Babihuga, 2007; Beck et al., 2010). Despite having set up some core FSI's, this paper will not only adhere to the stapled core FSI but in the vein of Beck et al.'s (2010) paper, will also include some additional ones due to data availability and restrictions. The complete dataset, composed of core and additional indicators is described by the IMF:

“...developed by the IMF together with the international community, are aimed at supporting macroprudential analysis—the surveillance and assessment of the strengths and vulnerabilities of financial systems. FSIs are macroprudential statistics aimed at filling the gap between macroeconomic statistics and micro-prudential data.” (IMF, 2026)

Prior to constructing the index, a min-max normalization was conducted in order to avoid certain components' increased spread and absolute values skewing the final value. Min-max normalization was thus chosen because it preserves the relative distribution of the data while placing all indicators on a common scale. As seen in equation (1), the transformation rescales each variable to a range between 0 and 1 by subtracting the minimum observed value and dividing by the range of the variable. The formula looks as follows:

$$\textbf{Equation (1): } X_{Norm} = \frac{X_i - X_{min}}{X_{max} - X_{min}}$$

4.1.2. Financial Inclusion

The data on the components for the FAS values were all gathered from the IMF's Financial Access Survey (FAS). This report analyses the drivers and usage of financial accessibility in the broader context of economic growth and sustainable development. As described by the IMF (2025) themselves, it represents the most comprehensive supply-side database on the usage of financial services, and accessibility, especially on an annual basis. Keeping up with policies and compiling much of the world's different countries into the database, the survey also provides yearly data from mainly 2004 up until 2025 with 121 different data series

Table 1 - Construction of financial inclusion indicator

Number of Automated Teller Machines (ATMs)	Per 100,000 adults
Number of active mobile money accounts	Per 100,000 adults
Number of all microfinance institution branches	Per 100,000 adults
Outstanding loans, commercial banks	Percent of GDP
Outstanding deposits, commercial banks	Percent of GDP

Source: Author's calculations.

The side of the explanatory variable, financial inclusion is influenced by Wang and Lou's (2022) paper which uses six key components into its calculation. These are:

“...including the number of banks per 1000 km², the number of banks per 100,000 adults, the number of ATMs per 1000 km², and the number of ATMs per 100,000 adults. We use outstanding deposits with commercial banks (% of GDP) and outstanding loans from commercial banks (% of GDP) for the latter dimension.” (Wang & Lou, 2022, p.5).

Although not entirely similar, this paper will construct an alternative one, originating from the aim of analyzing the key reliance of mobile money systems in SSA. Including as seen in Table 1: Number of active mobile money accounts per 100,000 adults, as well as number of microfinance institution branches which was suggested by Le et al. (2019). Similarly to the Financial Soundness Indicators, these were also normalized and rescaled in proportion to its relative components and placed between zero and one, and later on combined into one for each year and country to fit in the panel data layout.

4.1.3 Control Variables

Alongside the dependent and explanatory variables, a few control variables will be included. The amount is limited to four with additional controls for years in order to account for years of crises and pandemics for instance. The amount is kept rather low and similar to previous literature to be able to compare to previous literature that has been conducted in other forms and geographical settings. *gdppc_growth* is included in order to capture GDP growth which has been found to

have strong links to weakened loan qualities and profitability (Albertazzi & Gambacorta, 2009; Wang & Lou, 2022). The variable is transformed into its logarithmic state and comes from the World Economic Outlook (WEO) database by the IMF. Secondly, we account for inflation using the consumer price index (*cpi*) which has been sourced from Eurostat and their index on CPI, as it has been proven that inflation can help increase risks and effects of financial instability (Joudar & El Ghmari, 2025; Gadanez & Jayaram, 2008). Taken from the World Bank's Global Financial Development database is *bank_nonint* and it represents the non-interest income as a share of total income and is included in the analysis due to shown results that diversifying reduces risks of bank failure and instability (Wang & Lou, 2022; Demirgüç-Kunt & Huizinga, 2010). *Share_bank* is used to include metrics of bank size and concentration seen in earlier studies (Wang & Lou, 2022). But here it shows the assets of the five largest banks as a share of total commercial banking assets and is also from the World Bank's Global Financial Development database. The final of our main control variables is *exch_rate* which indicates the period average exchange rate relative to the Euro, it is sourced from the Exchange Rate dataset from the IMF. Also included are dummy variables for *time_period* to signal shifts in year that can occur as a result of certain global financial crises and pandemics such as the Covid-19. Some previous literature have included additional factors as controls which do not figure in this study since some of them are incorporated into the explanatory variables. Examples of such are mobile money affiliated variables as well as different measures of loans spread of banking institutions.

4.1.4. Instrumental Variables

For the use of finding causal links through instrumental variables (IV) regression, the two variables of *comtech* shows a summarized value of the adoption of communications technology through the aspects of: (1) mobile phone subscriptions; (2) Internet users; (3) landline internet subscriptions; (4) and landline phone subscriptions. The data is sourced from the International Telecommunication Union (ITU), via the World Bank and their World Development Indicators. The justification for this variable is the research found that communication infrastructure positively affects financial accessibility and through this channel then affects financial development (Beck et al., 2007; Pradhan et al., 2016; Wang & Lou, 2022; European Commission, 2016).

GII is the second IV and is the Gender Inequality Index (GII), which measures gender-based disparities across three different dimensions: (1) reproductive health; (2) empowerment; (3) and participation in the labour market. The variable captures how, and to what extent inequalities between women and men reduce a certain country's potential for human development. It ranges from 0 to 1, where 0 indicates complete equality between genders and 1 represents the highest possible level of inequality. The data comes from the UNDP and their Human Development Report. The reason for using this instrument is further debated by Wang and Lou (2022), who suggests that "...account ownership and the usage of savings and credit products display significant gender differences" (p.13). Gender measures are thus a strong reflector on financial inclusion, but contrary to Wang and Lou's paper, this one uses *GII* instead of Gender Parity Index. Although representing similar values.

5. Methodology

This study uses a quantitative fixed effects regression approach on panel data to examine the relationship between states of financial accessibility and financial stability across countries over time. The analysis is conducted using fixed effects regression models to account for unobserved country-specific heterogeneity. Further on, to address potential endogeneity concerns, an instrumental variable (IV) approach is also implemented in later stages.

5.1. Panel Data Regression

The basic regression analysis will use the previously described data to compute the results. Conducted by using the explanatory variable of *lnl_fas* which represents the logarithmic and lagged values of the financial inclusion index. It will be regressed upon one singular dependent variable, that of *ln_fsi*, or the indexed version of financial soundness described in part 3.2. Additional control variables will be included for each step, providing a gradual analysis which includes banking related measures such as *share_bank* and *bank_nonint* but also macroeconomic indicators such as *cpi*, *gdppc_growth*, and *exch_rate*. Additionally, the years included from the *time_period* variables, which are formulated annually from 2004 to 2024 will be included as

dummy variables in order to account for time-specific events and trends. The full model is presented as follows:

$$\textbf{Equation (2): } \ln_fsi_{it} = \beta_0 + \beta_1 \ln_fas_{it} + \beta_2 gdppc_growth_{it} + \beta_3 cpi_{it} + \beta_4 share_bank_{it} + \beta_5 bank_nonint_{it} + \beta_6 exch_rate_{it} + \alpha_i + \gamma_t + \varepsilon_{it}$$

In equation (2) α represents the country fixed effects and they are included to control for unobserved country-specific characteristics that remain constant over time. These include institutional structures, geographical conditions, or long-term economic characteristics that could alter financial stability. By controlling for these time-invariant factors, the implemented fixed effects estimator reduces omitted variable bias and improves the consistency of the estimated coefficients. γ is the control for time fixed effects which was elaborated on previously. And ε is the error term which represents the part of financial stability that is not explained by the variables included in the regression model. It includes the effects and influence of omitted factors, measurement errors, and random shocks that may affect the dependent variable but are not directly observed or controlled for in the analysis. As this is also a panel data approach, the error term may vary across both countries and time periods. The use of clustered robust standard errors helps account for potential heteroskedasticity and correlation within these error terms over time.

5.2. Instrumental Variable Approach

To address potential endogeneity concerns, the study applies an instrumental variable (IV) approach using a two-stage least squares (2SLS) estimation approach. Endogeneity could arise from reverse causality or omitted variable bias for instance. The IV approach helps isolate exogenous variation in the endogenous explanatory variable, allowing for a more reliable estimation of the causal relationship. The validity of the instrument is evaluated through first-stage testing and overidentification diagnostics. The first-stage F-statistic is used to analyse the strength of the instrumental variable in the first-stage regression. A good enough and high F-statistic indicates that the instrument is strongly correlated with the main explanatory variable, satisfying the relevance condition of the IV approach. Following previous literature, this paper follows through on the notion that a F-statistic above 10 is normally considered evidence against

a problem of weak instruments. This statistics is reported in table 6. Alongside testing the instruments quantitatively, reasoning and backing of literature is of grave importance to securing the solid and efficient use of these variables. This is something that has been elaborated and discussed in the literature review (3.4) and the data section (4.1.4). The drawn conclusions from these two were that they are strong enough to act as instruments in this case, but must still be considered with caution in the succeeding discussion and conclusion.

The IV is done in two stages, first of which is the first-stage aims at estimating the relationship between the instrumental variable and the explanatory variable. A strong relationship between the instrument and the endogenous regressor is necessary for instrument relevance. This looks like this:

$$\textbf{Equation (3): } \ln l_fas_{it} = \pi_0 + \pi_1 Z_{it} + \pi_2 X_{it} + \alpha_i + \gamma_t + u_{it}$$

In this equation, Z is the instrumental variable, X represents the control variables α are country fixed effects, γ are time fixed effects, and u is the error term for the first-stage regression.

In the second stage, the predicted values from the first-stage regression are used to estimate the effect of financial inclusion on financial stability. This approach aims to remove the endogenous component of the explanatory variable and improve causal interpretation. This is done three times from the existing variables, first only with *gii*, then with *comtech*, and lastly with the two instruments in one coherent model. The model is visualised as:

$$\textbf{Equation (4): } \ln_fsi = \beta_0 + \beta_1 \widehat{\ln l_fas}_{it} + \beta_2 X_{it} + \alpha_i + \gamma_t + \varepsilon_{it}$$

$\ln_fsi$ represents the dependent variable, and $\widehat{\ln l_fas}$ is the instrumented explanatory variable. Similarly to the first stage regression, X are the included control variables seen in equation (1). Following that are the country fixed effects (α), time fixed effects (γ) and the error term of the regression equation (ε)

5.2. Descriptive Statistics

In table 3, an overview and summary of the variables used in the study are presented. This includes the explanatory and the dependent variables, alongside controls and instruments. The full set combined includes 378 observations with a few data points missing for some variables. The *share_bank* variable has the lowest count at 257, mainly due to the restricted information on full financial data in SSA which pose a degree of improvement to future research. As some variables are transformed into their lagged and logarithmic values, describing their mean and span becomes different as *ln_fsi* has a mean of -0.67 and a standard deviation of 0.14, whilst the explanatory variable *lnl_fas* has a mean of -2.26 and standard deviation of 1.02. The mean exchange rate in relation to the Euro is 1 243, but with a significant spread, with some countries such as Ghana and Botswana, two export-oriented countries with large dependencies on the global economy, having much closer ties to the Euro and US Dollar. Whereas a country like Guinea has a relationary value of 10 925. Consumer price index is another measure with a large spread, with the mean being 91.24, but then having a lowest measure of 8.78 in Nigeria (2005), and a max value of 458.98 in Zambia (2024).

Table 4 presents the correlation matrix for the variables included in the analysis. Overall, the correlations between the explanatory variables remain relatively moderate, suggesting that severe multicollinearity is unlikely to be of major issue within the models. The highest observed correlation is between *ln_fsi* and *bank_nonint*, which displays a stronger negative relationship of approximately -0.56. Additionally, *share_bank* is negatively correlated with *ln_fsi*, while the GDP per capita growth presents a weak positive correlation with *ln_fsi*. The correlation between *lnl_fsi* and the dependent variable appears relatively weak and slightly negative. Further, *exch_rate* demonstrates a moderate negative correlation with *lnl_fas*, whereas most of the other correlations are relatively small in magnitude standards. The correlation coefficients are generally situated within expected economic relationships from previous literature (Wang & Lou, 2022) and do not indicate any significant overlap and multicollinearity between variables. However, important to note is that the correlation matrix is of descriptive nature and thus, does not imply any causal relationships, which is the ambition of the previously mentioned models.

Table 2 - Explanation of variables

Variable	Description	Source
<i>ln_fsi</i>	Logarithm of the Financial Stability Index	IMF, Financial Soundness Indicators
<i>lnl_fas</i>	Lagged Logarithm of Financial Inclusion	IMF, Financial Access Survey
<i>gdppc_growth</i>	Logarithm of Annual GDP per capita growth rate	IMF, World Economic Outlook
<i>cpi</i>	Consumer Price Index	Eurostat
<i>share_bank</i>	Five largest banks assets as a share of total commercial banking assets	World Bank's Global Financial Development database
<i>bank_nonint</i>	Bank non-interest income as share of total income	World Bank's Global Financial Development database
<i>exch_rate</i>	Period average exchange rate relative to Euro	IMF, Exchange Rates
<i>comtech</i>	Communications technology indicator	International Telecommunication Union
<i>gii</i>	Gender Inequality Index	United Nations Development Programme

Notes: Descriptions and clarifications of each variable names as they show up in the summary and result sections. Accompanied by the sources of the datasets.

Source: Author's calculations.

Table 3 - Descriptive statistics

	Count	Mean	SD	Min	Max
Main Variables					
<i>ln_fsi</i>	362	-.6742287	.1432073	-1.666554	-.4367612
<i>lnl_fas</i>	351	-2.26072	1.026634	-6.181979	-.2889299
Control Variables					
<i>gdppc_growth</i>	360	4.349167	4.447402	-18.07232	25.34428
<i>cpi</i>	314	91.24469	54.27728	8.777032	458.9833
<i>share_bank</i>	257	80.80208	15.6857	44.33098	100
<i>bank_nonint</i>	290	39.75035	10.33438	10.05221	78.19537
<i>exch_rate</i>	372	1243.64	1950.507	1.118884	10925.2
Instruments					
<i>comtech</i>	359	88.38882	65.92647	2.10459	308.0662
<i>gii</i>	326	.541592	.0837385	.325	.699

Notes: The five columns of the descriptive statistics provide summaries of observation count, mean, standard deviation, minimum value, and maximum value.

Source: Author's calculations.

Table 4 - Correlation Matrix

	<i>ln_fsi</i>	<i>lnl_fas</i>	<i>gdppc_growth</i>	<i>cpi</i>	<i>share_bank</i>	<i>bank_nonint</i>	<i>exch_rate</i>
<i>ln_fsi</i>	1						
<i>lnl_fas</i>	-.0173795	1					
<i>gdppc_growth</i>	.0864192	-.1953384	1				
<i>cpi</i>	.0442494	.1205941	-.089012	1			
<i>share_bank</i>	-.3437685	.1564726	-.1048725	.0402638	1		
<i>bank_nonint</i>	-.5567811	.0448628	-.0806913	-.1060358	.3344811	1	
<i>exch_rate</i>	-.0607299	-.3852343	.1429934	.091469	.0751911	-.0381225	1

Notes: This table presents the correlation coefficients between each variable. 1 represents a maximum correlation whereas 0 denotes no correlation found. .

Source: Author's calculations.

6. Empirical Analysis

This section presents the empirical analysis and discusses the results obtained from the regression estimations. The analysis begins with the regular fixed effects regressions, followed by the instrumental variables estimations used to indicate any one-way causal effects. The results are interpreted and discussed in 6.3 with relation to the theoretical framework and previous literature presented earlier in the study.

6.1. Baseline Fixed Effects Results of Panel Data

Before conducting the full regression analysis, a few tests were to be conducted in order to establish the foundation of the project. The Hausman test comes out with a result of 0.0084, thus rejecting the null hypothesis ($p < 0.05$). This signals that the assumptions required for random effects estimation are violated, meaning that the unobserved country-specific effects are correlated with explanatory variables included in the model. This enables the conclusion to be drawn that the fixed effects estimator is preferred within this context. Furthermore, the VIF testing does not signal any severe multicollinearity concerns, as all values remain below the conventional threshold of 10, instead being between the values 1.29 and 1.74. This strengthens the argument from the previous section which also found little evidence of multicollinearity concerns within the data.



Figure 3 - Collapsed mean of variables ln_fsi and lnl_fas

Source: Author's calculations.

In figure 3, the mean values of all countries are formed to help visualise any initial understandings of the linear relationship between the two core variables. Financial inclusion has seen a steady increase since the starting point of the data with the only real decrease in the lagged and logarithmic value of lnl_fas coming after the covid pandemic. ln_fsi on the other hand, which is also in a logarithmic form, is much more volatile, with less visible trends before 2020. Although this index was affected to large degrees by the financial crisis of 2007-2008 which massively reduces its observed value. This also strengthens the argument for the need of time-specific variables within the models. Yet as the large changes are significantly more apparent and direct within financial stability than financial inclusion can propose the arguments of unequal damage from external factors.

Table 5 presents the results from the fixed-effects regressions of the panel data examining the relationship between financial access indicators and financial stability across the chosen countries. The dependent variable in all specifications is ln_fsi . Across the four altering models presented in table 5, the coefficient for lnl_fas remains consistently negative. In the baseline regression presented in column (1) without controlling for banking characteristics and

macro-economic indicators, the coefficient is statistically insignificant, although present similar negative values to the rest. However, once additional banking sector variables and year controls are introduced in column (2), the coefficient becomes statistically significant at the 5 percent level. The magnitude of the coefficient is also increased in absolute values across the later specifications, indicating a stronger negative association between financial access and financial stability after controlling for the additional variables of banking sector characteristics and macro-economic indicators. The banking sector variables included in the analysis also display statistically significant relationships with financial stability. The variable *share_bank* exhibits a negative coefficient in both specifications where it is included and remains statistically significant throughout, albeit at the 1 percent level in model (2) and at the 10 percent level in model (4). With a point increase in the assets of the five largest banks as a share of total commercial, being associated with a 0.24 percent decrease in financial stability. Similarly, *bank_nonint* also presents a negative and statistically significant relationship with the dependent variable across the models which it appears in. Where a points increase in banks non-interest income as a share of total income results in a decrease of financial stability of 0.35 percent when all controls are included. The coefficients for both variables remain relatively stable between columns (2) and (4), at around 0.0024 to 0.0036, thus suggesting a consistent negative association with financial stability.

The macroeconomic control variables introduced in models (3) and (4) produce more mixed results. *cpi* displays a positive and statistically significant coefficient in both models, indicating a positive association with financial stability within the sampled period. Contrasting to that however, *gdppc_growth* remains statistically insignificant in model (3), but becomes statistically significant at the 10 percent level and negative in the fully specified model presented in model (4). In the fourth model, the coefficient indicates that a 1 percent increase in gdp growth, correlates with a 0.0035 percent decrease in the measure of financial stability, statistically significant at the 10 percent level. The exchange rate variable named *exch_rate* remains statistically insignificant throughout the analysis and displays near non-existent coefficient estimates.

Table 5 - Fixed effects regression of panel data

	(1) ln_fsi	(2) ln_fsi	(3) ln_fsi	(4) ln_fsi
lnl_fas	-0.0259 (0.0241)	-0.0653*** (0.0212)	-0.0848*** (0.0223)	-0.0666* (0.0321)
share_bank		-0.00312*** (0.000889)		-0.00242* (0.00121)
bank_nonint		-0.00265* (0.00147)		-0.00354** (0.00129)
gdppc_growth			0.000310 (0.00190)	-0.00354* (0.00196)
cpi			0.000712*** (0.000121)	0.000743** (0.000280)
exch_rate			0.0000184 (0.0000117)	0.0000164 (0.0000162)
Constant	-0.733*** (0.0546)	-0.460*** (0.101)	-0.954*** (0.0797)	-0.493*** (0.0946)
Observations	342	237	291	198
Year Controls	No	Yes	Yes	yes
R-Squared	0.0237	0.2186	0.2285	0.2995
No. of Countries	18	17	18	17

Notes: The table presents the results from the panel fixed-effects regressions examining the relationship between financial access characteristics and financial stability across countries over time. The dependent variable in all specifications is the logarithm of the Financial Stability Index (ln_fsi). Columns (1)–(4) progressively introduce additional banking sector indicators and macroeconomic control variables to test the robustness of the estimated relationships. The later regressions include year fixed effects to account for common time-specific shocks affecting all countries simultaneously. Robust standard errors are reported in parentheses.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Source: Author's calculations.

The explanatory power of the regressions improves drastically as additional controls are introduced. The R-squared increases from 0.0237 in the baseline model to 0.2995 in the fully specified regression, suggesting that the inclusion of controls such banking sector variables, macroeconomic controls, and year fixed effects contributes substantially to explaining variation

in financial stability across countries and over time. The number of observations decreases across the models due to data availability constraints arising from the inclusion of additional variables, with the sample ranging between 198 and 342 observations across 17 to 18 countries.

Overall, the regression results indicate a relatively robust negative relationship between financial inclusion and financial stability across most models. With all controls included, financial inclusion presents a coefficient of -0.0666 statistically significant at the 10 percent level, barely scraping over the 5 percent level (0.054). As the explanatory and dependent variables are logarithmic, the interpretation of the coefficient is that a 1% increase in financial inclusion is associated with a 0.0666% decrease in financial instability. The consistency in the sign and statistical significance of the coefficients across the later regressions suggests that the estimated relationship remains stable after controlling for additional financial sector and macroeconomic characteristics.

6.2 Instrumental Variables Results

The Hansen J test of overidentifying restrictions does not reject the null hypothesis of instrument validity, with a p-value of 0.403. This suggests that the instruments are not statistically correlated with the error term and are therefore acceptable under the overidentification test.

The first-stage regressions show that both instruments are highly statistically significant predictors of financial accessibility. In the first model, *gii* exhibits a very strong negative relationship with *lnl_fas* with a 0.1 increase in the *gii* measure is associated with a 64.5 percent decrease in *lnl_fas* in model (1), and a 23.8 percent decrease when the variable *comtech* is also included. Important to note here is that the *gii* measure is reversed, in that higher value signals increased inequality. Reduced inequality thus increases the level of financial inclusion. On the other hand, *comtech* demonstrates a strong positive relationship in both the second and combined specifications. A unit change in the measurement of communication technology correlates with a 1.2 percent increase in *lnl_fas* within model (1), and a 0.9 percent increase in model (3) of table 6. The significance of the instruments in the first stage were both valid at the 1 percent level, which suggests that they have substantial explanatory power for the endogenous variable. The reported F-statistics are high across all model specifications, with values substantially exceeding

conventional weak instrument thresholds. This indicates strong instrument relevance as they are all above the acceptable limit of 15.

The instrumental variables estimations provide mixed evidence regarding the relationship between financial accessibility and financial stability. In the model where *gii* is used as the only instrument, the coefficient for *lnl_fas* is positive and statistically significant at the 1 percent level. The estimated coefficient of 0.0451 suggests that higher levels of financial accessibility are associated with increases in financial stability. This coefficient suggests that a 1 percent increase in the *lnl_fas* variable results in a 0.45 percent increase in the measurement of financial inclusion. This specification therefore provides evidence of a positive relationship between the two variables after accounting for potential endogeneity.

In contrast, the specification using *comtech* as the instrument produces a coefficient that is close to zero and statistically insignificant. While the direction of the relationship remains slightly positive, the results do not provide sufficient statistical evidence to conclude that financial accessibility has a measurable effect on financial stability within this model. The difference in results between the two models may indicate that the estimated relationship is sensitive to the choice of instrument, which will be elaborated further on in the discussion section of this paper.

The combined-instrument specification, where both *gii* and *comtech* are included simultaneously, also produces a positive coefficient for the results of financial inclusion, although the estimate remains statistically insignificant. The absolute value of the coefficient is situated between the previous two specifications, suggesting some consistency in the positive direction of the relationship even though statistical significance is not achieved when *comtech* is included. Overall, the second-stage results indicate that the positive relationship between financial accessibility and financial stability is strongest when *gii* is used independently as the instrumental variable.

Table 6 - Instrumental variable regressions

	(1)	(2)	(3)
Second Stage: Dependent variable = $\ln_fsi$			
$\ln_fas$	0.0451*** (0.0162)	-0.0014 (0.0100)	0.0134492 (0.0117246)
First Stage: Dependent variable = $\ln_fas$			
gii	-6.453*** (0.456)		-2.3751*** (0.5095)
$comtech$		0.0119*** (0.0007)	0.0095*** (0.0007)
Observations	185	198	185
R-squared	0.306	0.338	0.342
F-stat	213.480	399.290	189.184

Notes: The table presents the results from the instrumental variables fixed-effects regressions examining the relationship between financial accessibility and financial stability across countries over time. The dependent variable in the second-stage regressions is the logarithm of the Financial Stability Index ($\ln_fsi$), while the first-stage regressions report the determinants of the endogenous explanatory variable. The models are estimated using two-stage least squares (2SLS) in order to address potential endogeneity concerns. The regressions are done with the instruments separately as well as together. Column (1) is for gii , column (2) is $comtech$, and column (3) is combined

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Source: Author's calculations.

6.3. Discussion

This paper aims at exploring the relationship between financial literacy and financial stability and through an elaborated literature review and a quantitative methodology part provided necessary steps to paint parts of the picture of this situation. The hypothesis of this paper was that an increased level of financial inclusion within the measured countries leads to riskier parts of the population entering the financial system and formal banking interactions which ultimately leads to increased instability. Through the use of regression analysis, evidence was found that indicates that financial accessibility generally exhibits a negative association with financial stability across the sample countries. The fixed effects estimations consistently demonstrate a negative and statistically significant relationship between the variables during the base regressions, as the results showed that a 1% increase in financial inclusion correlates with a

0.0666% decrease in financial stability. These findings were coherent with some of the findings from Wang and Lou (2022), and were also aligned with the previous hypothesis proposed.

The instrumental variables estimations on the other hand provided contradictory results, with more mixed evidence. Although the magnitude and statistical significance of the coefficients change across models, the overall direction of the relationship remains largely positive throughout the analysis. These findings suggest that increased levels of financial inclusion may contribute to improvements in financial stability, although the strength of this relationship appears to depend on the underlying model and what instruments are selected. The statistically significant positive relationship identified in the IV approach through the instrument of *gii* aligns closely with the theory of financial intermediation (Dwumfour, 2017; Ozili, 2018). According to this framework, broader access to financial services allows financial institutions to mobilize savings more effectively, allocate capital more efficiently, and diversify financial risks across a wider customer base as seen in figure 2. Increased participation within the formal financial system may therefore contribute to greater resilience within the banking sector and the country and regions financial systems. Even though the instruments proved valid through testing of overidentification and presented F-statistics, as well as backing from previous literature, the insignificant results proves any causal relationship was hard to establish, especially with the use of communication technologies as an instrument as proposed by Wang and Lou (2022). The differences between the fixed effects and IV estimations may indicate the presence of endogeneity within the relationship between financial accessibility and financial stability. Reverse causality may also exist, and might even be proved with previous literature as will be discussed more on later. More stable financial systems may themselves help promote broader financial participation and greater accessibility. Further on, omitted institutional and macroeconomic factors may simultaneously influence both variables. The instrumental variable approach attempts to isolate the exogenous effects of financial accessibility, which may explain why the IV results become less statistically robust in certain models compared to the fixed effects estimations. Additionally, the use of instruments for the two authors' paper varied slightly from this one, optioning for a measure of physical technology levels and investments as opposed to the levels of effects from these instruments. This could have been the reason for the IV regression failing to compute a statistically significant result on this part. Another limitation

might have arisen from the differences in dependent variables between previous researchers use and this one. With some earlier research incorporating these instruments not only using financial soundness indicators but rather choosing bank Z-scores as their outcome. Despite their relative similarities, these two variables could change in their interaction with the instruments used. Even the use of the Gender Inequality Index as opposed to Gender Parity Index could in theory face difficulties in this regard and might explain why the sign of the causal relationship changed, and did so dramatically.

At the same time, the findings should also be interpreted in light of Minsky's (1992) theory of financial instability. While financial expansion and broader access to financial services may strengthen financial systems in the short run, rapid growth in financial activity can also contribute to excessive risk-taking, decreasing credit standards, and increased systemic vulnerability if regulatory oversight remains insufficient. The results observed within the regular regression seen in table 5 could point towards such a relationship, especially considering the lagged nature of the regression where financial inclusion takes a year to prove its effects on instability. But this can also point towards a two-way causal relationship where increased financial stability also increases the inclusivity of financial services, and ones too large, it causes financial instability. Within the statistically significant IV estimations it may on the other hand, in light of such frameworks from Minsky and related findings could instead be contradicted as it would create self-induced growth of stability measures which never ends if all other aspects remain constant. Yet, other things might play their parts here, and in some contexts, expanding financial accessibility without corresponding institutional development and regulatory capacity may weaken rather than strengthen financial stability over time as proposed by Schinasi (2004) and Ozili (2018).

Moving on to the control variables, which generally display relationships that are consistent with economic theory from previous literature. Macroeconomic stability appears to remain an important determinant of financial sector stability, while banking sector characteristics also continue to influence financial stability. These findings further support the argument that financial stability is shaped not only by access to financial services, but also by broader institutional and macroeconomic conditions. But if we break down these two aspects into their

core variables, we still see some interesting outcomes. Exchange rates for instance have been promoted as a steady influencer on the climate of financial stability. With Joudar and El Ghmari (2025) arguing for a significantly negative effect of exchange rates on the level of financial stability. Suggesting the changes in exchange rates would harm investor confidence which could eventually result in overreactions of financial measures, or financial instability (Ishrakieh, Dagher & El Hariri, 2020). Yet, in this study, no statistically significant association between exchange rate and financial stability. CPI does instead provide very robust coefficients and thus association towards the stability measure. With positive coefficients being in line with previous estimations, and where the results in table 5 prove statistically significant at the 5 percent level for both model (3) and (4). GDP growth per capita on the other hand does signal a negative correlation between it and the dependent variable, significant at the 10 percent level. Something that is not supported by previous literature, where economic growth is often found to be positively correlated and can even act as a driver of furthering financial stability (Próchniak & Wasiak, 2016; Wang & Lou, 2022). Nuancing the picture, previously mentioned studies does all analyse middle- to high-income countries and might therefore not be as applicable to the countries included in this dataset. This could therefore be presented as a gap in the literature that could be elaborated further on in future research.

From a policy perspective, the findings suggest there is no clearcut direction of where to move in terms of policy when it comes to financial literacy and financial stability. With evidence being found that suggests an increase in financial literacy without adequate additional measures associated with increased instability within the financial system. But with clear causal links being less attainable for observation and evaluation and those indications that this does exist, suggest the relationship has its sign reversed from the first regression. With positive effects being in action rather than negative. Despite being only correlatory associations that are evident in table 5, it can still provide useful insights for policymakers which aim at controlling their financial systems for the betterment of stability. It shows that increased accessibility should be navigated with caution as there might be negative consequences alongside the good ones as Wang and Lou (2022) showed as well in differing parts of the world. This would be of special interest specifically to the countries in question of this study which represents large parts of the

population bound to mobile money, a service that has taken financial accessibility to the top of the agenda in the region (World Bank 2026).

A region with such strong influence from financial technology on financial inclusiveness should focus on policies aimed at increasing financial accessibility in ways that also contribute positively to financial stability, for instance supported by strong institutional frameworks and effective financial regulation. However, the results from both models also indicate that expanding financial accessibility alone may not automatically generate greater financial stability. As the coefficients of causal and correlations are both relatively weak and thus not solely constitute the main direction of the outcome. Policymakers must therefore ensure that financial inclusion policies are accompanied by adequate regulatory oversight, financial supervision, and institutional development in order to prevent excessive financial risk accumulation. At the same time, as the region has been less hit by historical financial crises as reported by Beck et al. (2010), it could as well be argued that the concern of instability could be afforded to be overlooked in this regard. With such small effects, the benefits of large increases in formal banking participation and inclusiveness is larger than the net negatives of any decreases in financial instability levels.

Lastly, despite the findings of the study, several limitations should be acknowledged. The analysis remains constrained by data availability which occurs in most financial analyses in developing countries. Additionally, potential measurement limitations within the financial inclusion indicators, and the difficulty of fully satisfying the exclusion restriction within instrumental variable estimation could be causes of concerns. Furthermore, financial stability is influenced by a wide range of political, institutional, and structural factors that may not be fully captured within the model specifications, despite capturing country-specific controls. Nevertheless, the findings contribute to the growing literature examining the relationship between financial inclusion and financial stability, particularly within the context of Sub-Saharan Africa, a region heavily influenced by talks of inclusiveness, not least due to its massive investment towards financial technologies for its citizens.

7. Conclusion

The recent advancements in financial technologies such as mobile money in Sub-Saharan Africa has increased interests in questions of financial inclusion, not least within the region itself. It creates an interesting setting for studies on financial inclusivity in all its forms, and also its effects on the rest of the society. Kenya, for example, presents itself as a global leader in the modern technology of mobile money in an otherwise developing country environment, with vast rural populations. This provides an interesting opportunity to lead large parts of otherwise formally unbanked and informal people to engage in activities that directly affect the landscape of finances and the stability aspects of it. This paper did with this in mind set out to examine the relationship between financial inclusion and financial stability within a sample of Sub-Saharan African countries that has experienced different trajectories of inclusivity from mobile money alongside other indicators. Through a quantitative panel data approach using fixed effects and instrumental variable estimations, the study aimed to investigate whether increasing levels of financial inclusion would associate, and contribute to greater financial stability or whether they instead introduce additional financial risks and instability within the financial system. This was also the hypothesis prior to conducting the research that the introduction of riskier and less financially stable actors would lead to a decrease in the overall stability of the financial system.

The findings of the study provide mixed evidence regarding this relationship. The fixed effects estimations consistently identified a negative and statistically significant association between financial inclusion and financial stability, supporting the initial hypothesis that increased participation within formal financial systems may expose financial institutions to greater financial risks and vulnerabilities. These findings also align with previous literature and theories of financial instability in other economies, suggesting that rapid financial expansion without sufficient institutional and regulatory development may contribute to increasing financial fragility over time. At the same time, the instrumental variable estimations produced less consistent results. While some models indicated a positive relationship between financial inclusion and financial stability, the causal relationship proved difficult to establish with statistical significance across all models. In the model where such was found, it suggested that the effect of financial inclusion on financial stability was positive and further established the notion that this topic remains highly complex and is prone to potentially being influenced by

multidirectional causality, complex networks of channels and other macroeconomic conditions. The findings therefore can be suggested to indicate that financial inclusion does not automatically generate either greater stability or instability, but rather that its effects may depend on the institutional and regulatory environment in which financial expansion occurs.

The analysis of previous literature also further highlights the growing importance of financial technology and mobile money systems within Sub-Saharan Africa, where financial accessibility has expanded rapidly over recent years. While increased access to financial services may provide substantial developmental and economic benefits, the results suggest that policymakers should approach financial expansion with caution and ensure that inclusion policies are accompanied by effective financial regulation. It could also be argued that the association is too small to bear any real effects in which case stability should be tackled from other angles, letting financial inclusivity remain high on the agenda to promote microfinance development.

This paper contributes to the growing literature on financial inclusion and financial stability by providing empirical evidence from a Sub-Saharan African context, a region where questions of financial inclusion continue to remain high on the agenda of policymakers. Future research could try to solve issues of data availability and also use alternative measures of financial soundness and inclusiveness. Another angle that could tackle this question would as well be to directly target the channels through which the literature review suggests. One such way would be analysing if increasing financial inclusion enables riskier actors from small firms and individuals to enter into financial contracts that in the whole might harm the sector.

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Appendix

AI Statement:

AI was used in the process of this paper in terms of structuring the workload, as well as by browsing through ideas and theories in the initial stages of the paper to help with inspiration and finding possible sources of data. AI was further used to help broaden the view of possible additional literature that could help complement the initial ideas of the thesis. No AI was used during the process of writing or conducting any data treatments seen in this paper.