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Does Financial Inclusion Affect Financial Stability in Low-Income Countries?

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Abstract

Inclusive financial system, a breakthrough on the way of exploiting the potentiality and opportunities of an economy, is considered as a prerequisite for Sustainable Development Goals (SDGs) around the globe; especially in low-income economies apart from their economic and financial development. This scenario raises the question, whether financial inclusion ensures or degrades financial stability in low-income economies. A number of studies have been performed on this issue and have suggested both positive and negative ways in which financial inclusion could affect financial stability. But, most of those studies were based on a broad sample of countries, including many high-income economies. This paper contributes to the existing literature on this subject by estimating the effect of financial inclusion on financial stability, especially in low-income economies. After analyzing the causal relationship, this paper finds that ensuring financial inclusion by greater 'usage' and 'access' of financial system contributes positively to the financial stability in low-income economies by reducing the NPL ratio and increasing gross interest margin, even though it might cost with lower return on assets, increased non-interest expenses to maintain the additional credit expansion, and permitting some under-standard loans leading to disturbances in financial markets which are nominal in comparison with the benefit of fueling the productive sectors of the low-income economies. These findings suggest that policy measures to increase financial inclusion by ensuring easy access and greater usage would facilitate financial stability in low-income economies.

Keywords: Financial Inclusion, low-income economies, financial stability, financial soundness, economic development, inclusive financial system.

1. Introduction

Financial inclusion is a center of growing interest nowadays and one of the prominent socio-economic challenges on the agendas of governments, international institutions, policymakers, central banks, and financial institutions. Realizing the recognition of financial inclusion as a fundamental requirement for economic growth and poverty alleviation, the United Nations has already declared the objective of achieving universal financial access by 2020. Financial Inclusion being one of the fundamental bases for sustainable economic development focuses on the delivery of financial services to the majority of the economic participants like households and business entities, including the underprivileged sections of society, at an affordable cost and with ready access to banking services. By consolidating the economic activities of these participants under a single umbrella of financial services, financial inclusion does influence the growth of the economy, as previous studies suggest, in either way- positively, or negatively, or maybe, there is no substantial impact.

Financial Inclusion is rising globally. According to the 2017 Global Findex database, 1.2 billion adults have had an account in a financial institution since 2011, including 515 million since 2014. The share of adults having an account either with financial institutions or through mobile money services rose globally from 62 percent to 69 percent from 2014 to 2017. The rise is quite surprising from 54 percent to 63 percent in developing economies. Yet, women lag by 9 percentage points less likely than men to have bank accounts. The third edition of the database indicates the advancement towards digital technology is the key to achieving the World Bank goal of Universal Financial Access 2020.

World Bank's recent statistics find that almost half of the adult population around the world lacks having a bank account in a formal financial institution. However, the perception of measuring financial inclusion goes beyond single indicators, such as the percentage of bank accounts, number of bank branches, or availability of ATM services. The lack does exist in the case of measuring financial stability. To the best of the author's knowledge, existing literature lacks providing unquestionable methodology to measure financial inclusion and financial stability. This paper aims to fill this gap by incorporating both demand and supply-side information in measuring both.

Existing literature has reached no consensus on this issue. However, most of the studies were done based on a broad sample of countries, including many high-income ones which might influence the overall findings. This raises the question, whether financial inclusion ensures or degrades financial stability in low-income economies. The major contribution of this paper to the existing literature is the focus exclusively on low-income economies as against the previous studies. After analyzing the causal relationship, the author finds that ensuring financial inclusion by greater 'usage' and 'access' of the financial system contributes positively to the financial stability in low-income economies by reducing the NPL ratio driven by the higher credit base than before, and higher interest margin, even though it might cost with lower return on assets and increased non-interest expenses to maintain the additional credit expansion. However, aggressive credit facilities resulting from increased competition might permit some under-standard loans leading to disturbances in financial markets which are nominal in comparison with the benefit of fueling the productive sectors of the low-income economies. In addition, contrary to high-income economies, this credit expansion in low-income economies might require higher NPL provisions and tightening the regulatory capital adequacy requirement to capital to provide a cushion against any adversity. This paper also finds that ensuring financial inclusion by expansionary credit facilities remains positive if the financial markets in low-income economies are not burdened with idle liquid assets obtained from higher savings.

The rest of the paper is organized as follows. Section 2 illustrates the theoretical framework by defining financial inclusion and financial stability in terms of discussing existing literature, portraying the linkage between these two, and presenting some stylized facts about the relationship between measures of financial inclusion and financial stability. Section 3 describes the methodology this paper uses, more specifically, the attributes and sources of data, and the description of the model used in this paper. Section 4 interprets the results of the estimation, and also, the findings in the targeted area of interest. Finally, section 5 concludes the paper by suggesting further research scopes.

2. Theoretical Framework

2.1. Financial Inclusion

Financial Inclusion, treated nowadays as one of the fundamental bases for sustainable economic development, focuses on the delivery of financial services to the majority of the economic participants like households and business entities at an affordable cost and ready access to banking services. It has become a center of interest for policymakers, researchers, and other stakeholders. This intense interest reflects the understanding of the importance of financial inclusion for economic and social development. Access to financial services can help people improve their earning potential and thus reduce poverty improving the overall quality of their lives.

Financial inclusion is typically defined as the proportion of individuals and firms that use financial services (Global Financial Development Report, 2014). However, financial inclusion is different from access to finance. Lack of use does not mean the absence of access to finance. Some people may choose not to use financial services even after having access at an affordable cost, whereas many others may lack access because of high costs, regulatory barriers, or legal prohibition. The key point is the extent to which the lack of financial inclusion develops from a lack of demand for financial services or from these barriers or prohibitions.

Financial inclusion is based on the theme of equity and inclusive growth with stability. Even when financial institutions are enjoying tremendous growth and having significant improvements in all areas relating to financial feasibility, profitability, and competitiveness, the glass still remains half-full. The concern that financial institutions have not been able to include vast segments of the population especially the unprivileged sections of the society still exists. Financial inclusion aims at drawing the "unbanked" population into the formal financial system so that they have the opportunity to access financial services ranging from savings, payments, and transfers to credit and insurance (Hannig and Jansen, 2010).

Financial inclusion can be defined as the process of ensuring access to financial services and timely and adequate credit whereby vulnerable groups such as weaker sections and low-income groups at an affordable cost (The Government of India's 'Committee on Financial Inclusion in India': Rangarajan Committee 2008). This access to the financial system represents access through banking deposit accounts backed by deposit insurance, affordable credit access, and a payment system.

Financial inclusion is typically thought of in terms of credit accessibility in a formal financial institution, but this concept has more dimensions. There may also be alternatives to formal financial accounts, such as mobile money via mobile telephones. The main other financial service besides banking is insurance, especially for health and agriculture (Demirguc-Kunt and Klapper, 2012). Complying with this definition, in this paper, the author will use the percentage of adults using electronic payment services as a variable representing an alternative to formal financial accounts.

This paper defines financial inclusion as a process that ensures the delivery of financial services to all the economic participants like households and business entities at an affordable cost with ready access to financial services, usage of the formal financial system, and featured quality of the financial market. This definition emphasizes a few dimensions of financial inclusion, viz., accessibility, usage, and quality of formal financial systems. These dimensions are prerequisites to an inclusive financial system. As banks represent the most basic financial services, banking inclusion (or, alternatively, exclusion) is often

used as similar to financial inclusion (or exclusion). Because of the lack of reliable data on other financial services, this paper considers banking inclusion as being analogous to financial inclusion.

2.2. Financial Stability

After the thump of the global financial crisis (GFC) in 2007-08, the most fundamental issue that caught attention of the policymakers as well as economists around the world is financial stability. Economists, then, focused renewed attention on the stability of the financial sector. Nevertheless, it is not that simple to define or measure financial stability given the interdependence and the complex connectivity of different elements of the financial system among themselves and of course, with the economy.

As financial stability cannot be restricted within a single definition, it is wise to elucidate several key characteristics of financial stability. Firstly, financial stability is a broad concept covering various facets of the financial system-infrastructure, institutions, and markets where economic participants, both public and private, participate in financial markets. Thus, stability or instability could be the result of either private or public, or both simultaneously and/or iteratively. Secondly, financial stability ensures the smooth functioning of the payment system besides allocating economic resources and risks, mobilizing savings, and facilitating wealth accumulation. Thirdly, financial stability is not focused on the disturbance in financial markets, or at individual financial institutions if it is not hurting the economy at a large scale. Finally, financial stability is not only connected to the presence or absence of a financial crisis but also to its ability to absorb the sudden adversity in the financial system.

A financial system can be characterized as stable in the absence of excessive volatility, financial stress, or crises. This narrow definition is relatively easy to formulate even though fails to capture the real contribution of the well-functioning of financial system to overall economic performance. Undoubtedly, a broader definition of financial stability incorporates the smooth functioning of different elements of the financial system – financial markets, infrastructures, and institutions under the operation of given legal frameworks. But, policymakers are more concerned about the macro-economic dimension of financial stability. From that perspective, financial stability can be defined as a condition in which the financial system, which comprises financial intermediaries, markets, and market infrastructures, is capable of withstanding shocks and the unraveling of financial imbalances. This mitigates the prospect of disruptions in the financial intermediation process that are severe enough to adversely impact real economic activity (European Central Bank (ECB), 2019).

Some of the researchers defined the scope of financial stability as the continuity of an uninterrupted financial system supporting the efficient allocation of savings. Mishkin (1992) has defined financial stability "…as the prevalence of a financial system, which can ensure in a lasting way, and without major disruptions, an efficient allocation of savings to investment opportunities." Even agreeing with the definition of Mishkin, in most cases, it is not possible to judge until long after the event whether the allocation of savings to the investment opportunities was efficient.

Further, the ECB discloses two fundamental requirements for safeguarding financial stability. Firstly, the main sources of risk and vulnerability are to be identified as such sources include inefficiencies in the allocation of financial resources from savers to investors and in the mispricing or mismanagement of financial risks. Secondly, monitoring of financial stability must be forward-looking so that inefficient management can compromise future financial system instability (ECB, 2012).

In this paper, the author focuses more on the resilience of the financial system against any sudden adversity or shock. This paper defines financial stability as a financial system that (a) ensures both efficient allocation of economic resources and efficiency of other economic processes like wealth accumulation, economic growth, and social development; (b) assesses, allocates, and manages financial risks; and (c) maintains the ability to function smoothly even when affected by economic adversity or imbalances.

2.3. Interactions between Financial Inclusion and Financial Stability

The functioning of different financial system elements – infrastructure, financial markets, and institutions might affect financial stability as most of the researchers suggest. In response to the global financial crises during 1980-90 and 2007-08, economists and policymakers became more concentrated on finding remedial actions for the crisis-affected economies. Included in this effort were studies of the effect of financial inclusion on financial stability.

Financial stability being at the center of the focus issues has taught some crucial lessons like (a) financial stability can be vulnerable even when there is price and macroeconomic stability; (b) financial stability turns into an explicit variable from being an implicit variable of economic policy; (c) any threat to financial stability anywhere in the world could be a threat to financial stability everywhere, and (d) most importantly, while financial instability can harm even the most advanced economies, the damage it can make in weak and developing economies can be particularly severe.

This paper aims to answer whether financial inclusion affects financial stability in low-income countries. In other words, does financial inclusion improve or deteriorate financial stability in low-income economies? Scholars have reached no agreement on this relationship. They suggest both positive and negative ways that financial inclusion might have on financial stability. Alternatively, one could ask about the reverse causality, i.e. an increase in financial stability might lead to an enhanced or worsened financial inclusion. However, it is quite unlikely or illogical that increased financial stability leads to a decrease in financial inclusion.

Khan (2011) suggests several ways to validate the positive impacts of financial inclusion on financial stability. First, financial inclusion improves the efficiency of intermediation between savings and investments and ensures the diversification of the balance sheet of the financial sector accommodating a broader spectrum of economic agents. This higher level of diversification contributes to a more resilient economy. Second, financial inclusion helps provide a more stable source of funding as against financial institution's dependence on borrowed funds can greatly enhance the soundness and resilience of financial institutions, and also reduce the volatility in earnings. Third, financial inclusion, helping people move from cash-based transactions to bank account-based transactions that can be monitored, facilitates greater participation by different segments of an economy in the formal financial system. Fourth, the financial sector can contribute to enhancing financial stability by contributing to improved health of the household sector, small businesses, and, to some extent, that of the corporate sector. It also ensures better transmission of monetary policy. Finally, in most cases, efforts to include an increasingly large section of the population within the fold of formal banking and financial services have resulted in the deployment of innovative solutions and outsourcing arrangements. Such financial innovations have the potential to reduce financial costs thereby contributing to increasing the overall efficiency of the economy and the financial stability (Khan, 2011).

Financial inclusion mostly focuses on facilitating financial services to the unprivileged and unbanked segments of the economy, facilitating them with access to finance and low-cost services that act as key factors to the profitability and prosperity of the business sectors of the economy. Hannig and Jansen (2010) find that low-income people are less vulnerable to economic adversity. Including them in the financial system contributes positively by ensuring the stability of the deposit and loan bases as well as the sustainability of the financial system even in adverse situations.

Financial inclusion can also contribute to managing the distribution of credit losses in an economy. The shape of credit loss distribution helps select appropriate policies to promote broader and sounder access to bank credit for the poor and the unbanked. Small and medium-sized enterprises reduce the overall riskiness of financial institutions' loan portfolios and enhance financial stability (Majnoni et al., 2006). They also found that the systematic risk of small and medium-sized firms is greater compared to that of large firms. Similarly, inadequate access to finance for small and medium-sized firms may hurt the economy. Prashad (2010) argued that limited access to credit for small and medium-sized enterprises which are more labor intensive in their operations strike adversely on overall employment growth, contributing adversity to financial stability. He also finds financial instability due to contraction in the financial system.

This is not to be stated that there are no negative aspects to financial stability stemming from greater financial inclusion. If we recall the savings and loan crisis in the US in the 1980s, we can see that even financial institutions intended to facilitate retail investors and, thereby, promote financial inclusion, could eventually lead to financial instability. Khan (2011) also cites several ways in which financial inclusion affects adversely on financial stability. First, financial inclusion typically involves a large number of low-profile clients with a proportionate burden on the operating costs of financial institutions. Second, facilitating low-income people is associated with informational inefficiencies with most borrowers unable to produce any collateral or to provide adequate track records of repayments. Third, financial institutions facilitating financial inclusion often need to incur substantial costs as they adjust their business practices. Fourth, financial institutions attempting to expand the credit facility results in a compromising standard of lending. This was the prominent contributor to the severity of the "sub-prime crisis" in the United States. Fifth, Increased lending facilities to reach small borrowers require outsourcing various functions like credit assessment. This contributes to an increase in reputational risk. Finally, a lack of control for micro-finance institutions (MFIs), increasing the number of lending, would adulterate the effectiveness of regulations in the economy and financial system.

Morgan and Pontines (2014) analyzed the causal relationship between financial inclusion and financial stability using SME loans as a measure of financial inclusion and, banks' z-scores and NPL as measures of financial stability. They find it mutually reinforcing. Their estimation results show that increased lending to small enterprises aids financial stability, mainly by reducing NPLs and a lower probability of default by financial institutions.

Most of the research works done so far used a broad sample of countries regardless of income classes, including many high-income economies. This paper will study whether financial inclusion ensures or degrades financial stability, especially in low-income economies.

2.4. Stylized Facts of Financial Inclusion and Financial Stability

Earlier sections already discussed three dimensions of financial inclusion- accessibility, usage, and quality of formal financial systems. This section will figure out some simple comparisons of the relationship between the indicators of financial inclusion and financial stability based on the data obtained from various data sources. A set of indicators will be used to represent financial stability as suggested by IMF's Compilation Guide on Financial Soundness Indicators 2006.

Figure 1 shows non-performing loans provision to capital increases along with an increase in no. of branches (correlation coefficient 0.4031) (see Table A3). However, the figure also shows very weak correlations or non-correlations with the increase in the use of electronic payments for making payments (correlation coefficient 0.1147), the increase in no. of ATM (correlation coefficient 0.0529), and the nearness of credit availability to the frontier (correlation coefficient 0.0518). The figure illustrates that banks can facilitate more credit availability and reach new markets including the previously unprivileged and unbanked population as the number of bank branches increases. However, these facilities might require more NPL provisions to capital as the credit risk goes up with increased credit facility.

As shown in Figure 2, non-performing loans to total gross loans decreased along with the increase in the percentage of savers in the past year (correlation coefficient -0.3752), and the increase in the use of electronic payments for making payments (correlation coefficient -0.2596) (see Table A3). Apart from this, the increase in the percentage of adults having at least one loan outstanding in a formal financial institution (correlation coefficient -0.1781) and the nearness of credit availability to frontier (correlation coefficient -0.0522) exhibit very weak correlations or non-correlations with the NPL ratio. The increase in the percentage of savers in the past year and the increase in the use of electronic payments provide additional liquidity for financial institution to support their extensive credit facility. This increased credit facility facilitates with increased total loan base for financial institutions. Thus, NPL to total gross loan looks decreased given that the non-performing loan amount remains unchanged even though the possibility of the increase in non-performing loans still exists. Moreover, an additional base of credit facilities might contribute to reducing the overall cost of financial institutions and better management of credit risk contributing to a lower NPL ratio.

Return on assets decreases along with the increase in the percentage of savers in the past year (correlation coefficient -0.2249), increase of no. of ATMs (correlation coefficient -0.3345), and increase in the use of electronic payments for making payments (correlation coefficient -0.3247) (see Table A3). On the other hand, a non-correlation is found with the increase in the percentage of adults having at least one loan outstanding in a formal financial institution (correlation coefficient 0.0698). This is shown in Figure 3. This figure illustrates that the financial institution is burdened with excessive liquidity when they cannot utilize the savings obtained from the increase in percentage savers in the past year. When a large amount of savings remains idle, it reduces the profitability of assets. Similarly, an increase of no. of ATMs and updating electronic payment networks require a large amount of construction cost which cannot be redeemed immediately, eventually contributing to reduced return on assets.

Figure 4 shows that liquid asset to total asset decreases along with the nearness of credit availability to the frontier (correlation coefficient -0.1897) (see Table A3). However, the figure also shows non-correlations of liquid assets to total assets with the increase in the percentage of adults having at least one loan outstanding in a formal financial institution (correlation coefficient -0.0295), the increase in the use of electronic payments for making payments (correlation coefficient -0.0798), and the increase of no.

of ATM (correlation coefficient -0.0815). An increase in the nearness of credit availability to the frontier indicates that the management of financial institutions has managed to allocate their savings into investments which has reduced the idle liquid assets of financial institutions.

All the figures illustrated above are based on the dataset employed without using any control variables. As a result, there are relationships between independent variables in some places which might indicate collinearity. In this paper, four control variables are used along with other independent variables to solve this problem. Also, this paper uses the Hausman-Taylor model which incorporates both the time-variant and the invariant variables at the same time.

3. Methodology

3.1. Attributes and sources of data

The single most popular cross-country dataset that includes a large number of variables related to financial inclusion, incorporated with several macroeconomic variables and variables related to financial development and financial stability is World Bank's Global Financial Development Database (GFDD)[1]. It is an extensive dataset of financial system characteristics for 206 economies covering data series for 57 years (1960-2017), although the most crucial variables intended to be used in this paper are shorter periods. The database consists of several measures of the financial systems such as the size of financial institutions (financial depth), the degree to which households and business entities can use financial services (access to finance), the efficiency of financial intermediaries and markets in intermediating between savings and investments (quality of financial systems and market), and stability of financial institutions and market (financial stability).

The GFDD also incorporates World Bank's Global Financial Inclusion Database (Global Findex)[2] which is another comprehensive dataset providing survey data on how adults save, borrow, make payments, and manage risk. Launched with funding from the Bill & Melinda Gates Foundation, the database has been published every three years since 2011. These data are collected through nationally representative surveys of more than 150,000 adults in over 140 economies all around the world. The 2017 edition includes updated indicators on access to and use of formal and informal financial services. In addition to the previous edition, this new edition also provides data on financial technology (fintech), including the use of mobile phones and the Internet for making financial transactions.

In most cases, data on financial inclusion in the GFDD encounters severe missing problems, though, data on several financial inclusion indicators are available for about 14 years (2004-2017). Data from the Global Findex database, however, are available only for 2011, 2014, and 2017, including the percentage of adults having at least one account at a formal financial institution, the percentage of adults who used electronic payments to make payments, and percentage of adults saved in a formal financial institution in the past year, which are arguably best measures of financial inclusion, at least for households. This situation leaves the author with a choice of either using cross-section analysis or panel data analysis with a different model that can incorporate these data. Keeping this in mind, this paper uses the average of

[1] The GFDD database is available at: https://datacatalog.worldbank.org/dataset/global-financial-development. For a complete description of the dataset and a discussion of the underlying literature, see Martin Cihak; Asli Demirguc-Kunt; Erik Feyen; and Ross Levine, 2012. "Benchmarking Financial Systems Around the World." World Bank Policy Research Working Paper 6175, World Bank, Washington, D.C.

[2] The Global Findex database is available at: https://globalfindex.worldbank.org.For a complete description of the dataset and a discussion of the underlying literature, see Demirguc-Kunt, 2012. "Measuring Financial Inclusion: The Global Findex database" Development Research Group Policy Research Working Paper 6025, World Bank, Washington, D.C.

those interval-based data in each year of the targeted period of study which makes the data time-invariant in nature. This situation is slightly better in the case of the data collected from the GFDD database, which is time-variant. The author uses the Hausman-Taylor model that incorporates time-variant and time-invariant data at the same time.

The Scarcity of data on financial stability is less of an issue compared to the data related to financial inclusion. Examples of data on financial stability in the GFDD include the ratio of private credit by deposit institutions and other financial institutions to GDP (in percentage), liquid assets to deposits and short-term funding (in percentage), financial openness, and banking z-score (an indicator of the probability of default of the economy's banking system). These data are usually available for about 13 years (2004-2016), and in some cases noticeably longer, although, again suffer from missing problems for data on some economies.

The International Monetary Fund's (IMF) Financial Access Survey (FAS)[3] facilitates additional necessary data, mostly related to the financial inclusion of non-bank financial institutions such as micro-finance institutions (MFI), insurance companies, and credit unions. In addition to these data, this database also provides data on commercial bank loans and deposits. The share of SME loans or borrowers as a proportion to total loans or borrowers can be calculated using the loans and deposits data to SMEs, as it also provides data on total loans and deposits of commercial banks. This database covers 189 economies, including 03 recently enlisted economies- Anguilla, Montserrat, and Kosovo. However, these economies have been excluded in this paper as they have not been provided with any income-based classification by the World Bank. The FAS database provides data for 14 years (2004-2017), even though there are also some missing values for a few economies.

The World Bank's Global Payments System Survey (GPSS) is the only global survey-based database that combines various quantitative and qualitative measures of payment systems development worldwide reflecting the factors that hinder and/or facilitate them to help guide policy-dialogue at the international and national levels, and World Bank Group technical assistance. GPSS[4] provides time-series data on 115 economies for a period of 06 years (2010-2016). Examples of such data are the availability of POS terminals, the number of e-money accounts for mobile payments, etc.

Another important database that provides additional data on financial inclusion, measuring access and quality of financial services, is the World Bank's G20 Financial Inclusion Indicators database[5]. The indicators incorporate data that assess the state of financial inclusion and digital financial services, at national and global stages. Data from this dataset will be used as measures for the dimension of financial inclusion – the quality of the financial system.

IMF in cooperation with national authorities from economies around the world launched a Compilation Guide on Financial Soundness Indicators, which was published in March 2006 (IMF 2006). This set of FSIs will be a source of additional data on financial stability in this paper. A total of 39 FSIs are divided into two groups. The first group consists of the main indicators (the core set) relating to the banking sector (12 indicators) and the remaining 27 recommended indicators belong to the second group

[3] The IMF's Financial Access Survey (FAS) database is available at: http://data.imf.org/?sk=E5DCAB7E-A5CA-4892-A6EA-598B5463A34C.

[4] The WB's Global Payments System Survey (GPSS)database is available at: https://www.worldbank.org/en/topic/financialinclusion/brief/gpss

[5] The WB's G20 Financial Inclusion Indicators database is available at: http://datatopics.worldbank.org/g20fidata/

(encouraged set), which includes some more banking sector indicators including indicators mostly from non-bank financial institutions, non-financial corporations, households, financial markets and property markets. This paper uses mostly the core set to define banking stability as being analogous to financial stability, as the banking sector renders the most basic financial services. Gersl and Hermanek (2007) attempts to construct an aggregate index for the Czech Republic using this set of FSIs.

3.2. Parameters and Model

As defined earlier, data on financial inclusion are categorized based on three dimensions- access to financial services, usage of formal financial systems, and featured quality of the financial market, which is partially supported by the suggestion of AFI. They suggested four parameters – access, usage, quality, and welfare. This paper considers the quality and welfare of the financial system in a single dimension – quality. However, Sarma (2008, 2012) suggested 3 dimensions – accessibility, availability, and usage of the formal financial systems, whereas this paper considers accessibility and availability in the same dimension – access to the financial system. Besides, financial stability data, in this paper, has been categorized into 4 dimensions – capital adequacy, assets quality, earnings and profitability, and liquidity. This paper examines whether financial inclusion affects financial stability in low-income economies using the Hausman-Taylor model, an instrument variable (IV) estimator, that enables the coefficients of time-invariant regressors to be estimated in addition to estimating the coefficients of time-variant regressors (Stata.com, 2019) (Cameron and Trivedi, 2010). Besides this, within each of these two types of data nature, this model classifies the data as endogenous or exogenous based on an assumption that some of the regressors are correlated with the unobserved random individual-specific effects (labeled as endogenous).

To analyze the causal relationship between financial inclusion and financial stability, the author estimates the following Hausman-Taylor model (individual-effect model):

$$FS_{it} = TV'_{1it}\beta_1 + TV'_{2it}\beta_2 + TI'_{1i}\gamma_1 + TI'_{2i}\gamma_2 + \alpha_i + \varepsilon_{it} \quad (1)$$

Where FS_{it} is the measure of financial stability; regressors with subscript 1 are assumed to be uncorrelated with α_i and regressors with subscript 2 are assumed to be correlated with α_i; TV denotes time-variant regressors; TI denotes time-invariant regressors; β and γ are coefficient vectors measuring the point of interest in this paper, i.e., the effect of financial inclusion on financial stability; α_i is the unobserved random individual-specific effects that are assumed to have zero mean and finite variance, σ_α^2, and to be independently and identically distributed (i.i.d) over the panels; ε_{it} is the idiosyncratic error that is assumed to have zero mean and finite variance σ_ε^2 and to be i.i.d. over the observations in the data; $i = 1, \ldots, n$ represents a number of panels in the sample; and $t = 1, \ldots, T$ represents time. All the regressors are assumed to be uncorrelated with ε_{it}.

To estimate equation (1), this study employs unbalanced panel data for the period 2010-2016 (see Appendix 3). Data on the measures of financial inclusion employed in this section are made available from the World Bank's Global Financial Development Database (GFDD), Global Financial Inclusion Database (Global Findex), G20 Financial Inclusion Indicators database, and IMF's Financial Access Survey (FAS). As measures of financial inclusion, time-variant exogenous variables and time-invariant exogenous variables[6] used in the analysis are tabulated in Appendix 3. Control variables (assumed to be

[6] Data, mostly from Global Findex, representing as measures of financial inclusion are available only for 2011, 2014, and 2017. These data are unarguably impossible to drop. So, the author takes the average of the available years (2011 and 2014 as the targeted timeframe is 2010-2016) in each of the years making the variables time-invariant in nature.

time-variant exogenous) used in the model are the logarithm of GDP per capita ($lgdp_{i,t}$), percentage of private credit by deposit and other financial institutions to GDP ($pcrdgdp_{i,t}$), percentage of liquid assets to deposits and short-term funds ($lassdep_{i,t}$), and financial openness ($finopn_{i,t}$).

In estimation, the author uses a dummy variable $dlowincome_i$, which carries values 1 and 0 when an economy falls into the low-income group and high-income group, respectively according to the World Bank's income group classification (see Appendix 3). The estimation model generates a dummy variable for all other variables except the controls by multiplying them with $dlowincome_i$.

Variables used as measures of financial stability considering four of the dimensions, as discussed earlier in this section, are obtained from IMF's Financial Soundness Indicators (IMF 2006) core dataset. As the data collected for measures of both financial inclusion and financial stability are of different units, this paper transforms the total dataset of selected measures into a standardized model.

4. Results and Findings

4.1. Results of the estimation model

Basic descriptive statistics and correlations of the variables (both for the original and standardized model) employed in the analytical section are presented in Tables A1, A2, A3, and A4 (see in Tables). Using the income category of the World Bank, countries having at least 05 years of data from 2010 to 2016 have been considered for the estimation. This paper has found a set of 62 economies having common variables' data available. One important feature of the dataset, as presented in tables A1, and A2, is that most of the variables provide a maximum of 434 observations while having at least a minimum of 418 in a few variables. The correlations presented in Tables A3 and A4 are quite low, especially those among the exogenous variables assumed in the model, which suggests that multicollinearity is less likely to be an issue in empirical analysis. The correlations also support one most fundamental requirements of the Hausman-Taylor model that the endogenous variables must have a significant correlation with the instruments to provide sufficient information for identifying the parameters, as shown in tables A3 and A4, strong correlations of instruments with two endogenous variables –$natm_{i,t}$ and $paelec_i$.

In estimation, variables employed as measures of financial stability are used category-wise as dependent variables for both original and standardized models. Tables 1a, 1b and 1c represent estimation results based on dependent variables' category.

Table 1a depicts the estimation results for the 'capital adequacy' category of financial stability. Referring to standardized models in column (1) and (2), it is shown that one of the financial inclusion measure's dummies ($d\_nbrn_{i,t}$) are insignificant even though it shows consistently negative coefficients, that is, a higher number of branches of financial institutions per 100,000 adults leads to lower capital adequacy requirements in general, irrespective of any income class. On the contrary, the standardized model in column (3) shows that the dummy ($d\_nbrn_{i,t}$) is positive and significant, that is, a higher number of branches of financial institutions per 100,000 adults leads to a lower percentage of non-performing loans provisions to capital in high-income economies, although, leading to higher percentage of non-performing loans provisions to capital in low-income economies as the summation of both the coefficients is positive.

In columns (1), (2) and (3) for standardized models, the respective dummy ($d\_\ pasaved_i$) is positive, even though, with a weak significance at a 10% significance level, indicating that greater savings in the

past year lead to a higher percentage of regulatory capital to risk-weighted assets, and tier-1 capital to risk-weighted assets in low-income economies as the summations of the coefficients of both $pasaved_i$ and $d\_pasaved_i$ are positive except in case of column (3) indicating consistent findings with original models, the impact on non-performing loans provisions to capital being negative in low-income economies.

Finally, the most focused variable in the Hausman-Taylor model, the time-invariant endogenous variable which is $paelec_i$, in columns (1) and (2) for standardized models, the author finds that the coefficients are positive and significant, meaning that greater use of electronic payments for making payments leads to a higher percentage of regulatory capital to risk-weighted assets and tier-1 capital to risk-weighted assets in high-income economies. On the contrary, in columns (1) and (2) for standardized models, the dummies (d_paelec_i) are consistent with the findings from the original model.

In terms of the controls, in column (2) for standardized models, the author finds financial openness as measured by $finopn_{i,t}$ is significantly positive meaning that a higher degree of financial openness contributes to increasing the tier-1 capital requirement to risk-weighted assets in general, irrespective of any income class.

Table 1b describes the estimation results for 'asset quality' and 'liquidity' categories of financial stability. In column (4), the percentage of non-performing loans to total gross loans represents 'asset quality', and in column (5), the percentage of liquid assets to total assets represents 'liquidity'. Referring to standardized models in column (4), $nbrn_{i,t}$ is found to be significantly negative whereas the dummies ($d\_nbrn_{i,t}$) are insignificant even though they show a positive impact, that is, a higher number of branches of financial institutions per 100,000 adults leads to lower percentage of non-performing loans to total gross loans in general, irrespective of any income class.

Lastly, referring to column (4) for standardized models, the most important variable in the estimation model ($paelec_i$) is significantly positive, indicating that higher use of electronic payment for making payments leads to higher NPL percentage to total gross loans in all economies, irrespective of any income class. In column (5) for both models, variables like $d\_natm_{i,t}$ and $d\_\ paelec_i$ are not counted for interpretation as the respective original variables to these dummies - $natm_{i,t}$ and $paelec_i$ are not found significant in the analysis.

In a word, from table 1b, the author finds $pasaved_i$ as the only variable that has a difference in low-income economies, (summation of the both original and dummy variables' coefficient is -0.411) as compared to $nbrn_{i,t}$ and $paelec_i$ (coefficients are -0.972 and 5,869, respectively) in all the economies, irrespective of any income class in case of the percentage of non-performing loans to total gross loans.

Table 1c shows the estimation results for the dimension 'earnings & profitability' that represents financial stability. In column (8), for standardized models, this paper finds $d\_paloan_{i,t}$ show positive coefficients indicating that a higher percentage of the adult loan outstanding in financial institutions results in a higher percentage of interest income in low-income economies, albeit the results are only weakly significant at 10%.

Again, referring to column (6) standardized models, $d\_nbrn_{i,t}$ being significantly positive, that is, the greater number of branches of financial institutions per 100,000 adults leads to a higher percentage of return on equity in low-income economies as the summation of both the coefficients is positive.

Table 1a. Housman-Taylor Estimation Results, 2010-2016
(Financial Stability Indicator Category: Capital Adequacy)

	(1) Regulatory Capital to Risk-Weighted Assets, Percent ($rcrwa_{i,t}$)		(2) Tier-1 Capital to Risk-Weighted Assets, Percent ($t1rwa_{i,t}$)		(3) Non-performing Loans Net of Provisions to Capital, Percent ($nplprov_{i,t}$)	
	Original Model	**Standardized Model**	**Original Model**	**Standardized Model**	**Original Model**	**Standardized Model**
TVexogenous						
paloan $_{i,t}$	-0.045	-0.080	-0.045	-0.080	-0.330	-0.060
	(0.047)	(0.083)	(0.045)	(0.078)	(0.396)	(0.072)
d_paloan $_{i,t}$	0.382	0.671	0.412	0.720	-1.035	-0.183
	(0.207) *	(0.368) *	(0.2) **	(0.351) **	(1.82)	(0.331)
nbrn $_{i,t}$	-0.167	-0.858	-0.183	-0.925	-2.444	-1.287
	(0.032) ***	(0.164) ***	(0.03) ***	(0.155) ***	(0.275) ***	(0.145) ***
d_nbrn $_{i,t}$	-0.116	-0.640	-0.113	-0.610	2.453	1.314
	(0.11)	(0.571)	(0.106)	(0.543)	(0.965) ***	(0.511) ***
lgdp $_{i,t}$	0.004	0.025	0.004	0.023	-0.035	-0.020
	(0.006)	(0.032)	(0.005)	(0.03)	(0.048)	(0.027)
pcrdgdp $_{i,t}$	0.002	0.023	-0.002	-0.027	0.017	0.022
	(0.004)	(0.051)	(0.004)	(0.048)	(0.034)	(0.044)
lassdep $_{i,t}$	0.016	0.068	0.002	0.006	0.094	0.042
	(0.012)	(0.051)	(0.011)	(0.048)	(0.101)	(0.044)
finopn $_{i,t}$	0.003	0.034	0.008	0.086	-0.001	-0.001
	(0.004)	(0.041)	(0.003) **	(0.039) **	(0.034)	(0.04)
TVendogenous						
natm $_{i,t}$	-0.041	-0.532	-0.028	-0.357	-0.094	-0.126
	(0.017) ***	(0.217) ***	(0.016) *	(0.205) *	(0.14)	(0.188)
d_natm $_{i,t}$	0.034	0.468	0.014	0.195	0.524	0.686
	(0.056)	(0.736)	(0.054)	(0.695)	(0.478)	(0.642)
TIexogenous						
dlowincome $_{i}$	-6.317	-8.916	-3.559	-8.983	-209.891	-0.766
	(10.276)	(4.937) *	(10.77)	(5.07) *	(133.096)	(6.3)
pasaved $_{i}$	-0.972	-4.973	-1.003	-5.125	-12.803	-7.164
	(0.383) ***	(2.014) ***	(0.397) ***	(2.065) ***	(4.665) ***	(2.54) ***
d_pasaved $_{i}$	0.970	5.175	0.990	5.260	12.402	6.743
	(0.545) *	(2.854) *	(0.565) *	(2.926) *	(6.678) *	(3.592) *
discmid $_{i}$	-1.089	-0.247	-3.177	-0.772	-99.439	-2.763
	(4.397)	(1.189)	(4.603)	(1.231)	(56.782) *	(1.578) *
d_discmid $_{i}$	5.818	1.629	8.249	2.233	97.638	2.620
	(7.141)	(1.945)	(7.485)	(2.017)	(92.859)	(2.596)
dischigh $_{i}$	-3.691	-0.946	-5.009	-1.257	-119.928	-3.361
	(4.554)	(1.234)	(4.772)	(1.279)	(59.271) **	(1.651) **
d_dischigh $_{i}$	9.657	2.678	10.633	2.881	108.175	2.927
	(7.591)	(2.07)	(7.969)	(2.15)	(99.295)	(2.777)
getcred $_{i}$	-0.062	-0.374	-0.063	-0.332	-1.429	-0.590
	(0.099)	(0.48)	(0.104)	(0.499)	(1.297)	(0.643)
d_getcred $_{i}$	0.271	1.531	0.219	1.202	1.232	0.414
	(0.151) *	(0.795) **	(0.159)	(0.823)	(1.962)	(1.045)
TIendogenous						
paelec $_{i}$	0.781	5.840	0.808	6.034	9.972	8.175
	(0.298) ***	(2.285) ***	(0.308) ***	(2.339) ***	(3.589) ***	(2.855) ***
d_paelec $_{i}$	-1.983	-16.322	-1.984	-16.195	-9.276	-6.354
	(0.944) **	(7.463) **	(0.977) **	(7.633) **	(11.528)	(9.257)
_cons	24.446	0.178	23.436	0.361	225.813	2.246
	(8.754) ***	(1.069)	(9.17) ***	(1.11)	(113.355) **	(1.429)
No. of Observations	396	396	396	396	394	394
No. of Groups	62	62	62	62	62	62
Wald chi2(21)	55.080	55.260	63.890	63.900	87.050	86.630
Prob > chi2	0.000	0.000	0.000	0.000	0.000	0.000
sigma_u	7.897	2.154	8.326	2.246	105.758	2.954
sigma_e	1.998	0.545	1.900	0.512	16.954	0.474
rho	0.940	0.940	0.951	0.951	0.975	0.975

Note : TV refers to time varying; TI refers to time invariant. The estimators are based on the proposal by Housman and Taylor (1981) and by Amemiya and MaCurdy (1986). Standard errors are reported in parentheses. Wald chi2 and prob>chi2 represents the significance of the Housman-Taylor estimation model. p-values from the Wald tests in the outputs use t and F distributions instead of the large-sample normal and χ^2 distributions.
*, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Source: Author's calculation based on the data from WB's GFDD, Global Findex, GPSS, G20 Financial Inclusion Indicators and IMF's FAS, Financial Soundness Indicators database (IMF 2006).
Income Group: World Bank

Table 1b. Housman-Taylor Estimation Results, 2010-2016
(Financial Stability Indicator Category: Asset Quality and Liquidity)

	(4) Non-performing Loans to Total Gross Loans, Percent ($npl_{i,t}$)		(5) Liquid Assets to Total Assets (Liquid Assets Ratio), Percent ($liqass_{i,t}$)	
	Original Model	**Standardized Model**	**Original Model**	**Standardized Model**
Tvexogenous				
paloan $_{i,t}$	-0.105	-0.097	-0.050	-0.023
	(0.075)	(0.069)	(0.093)	(0.043)
d_paloan $_{i,t}$	-0.041	-0.032	-0.441	-0.205
	(0.34)	(0.312)	(0.409)	(0.188)
nbrn $_{i,t}$	-0.365	-0.972	-0.046	-0.057
	(0.052) ***	(0.138) ***	(0.064)	(0.085)
d_nbrn $_{i,t}$	0.189	0.529	-1.002	-1.360
	(0.18)	(0.483)	(0.217) ***	(0.292) ***
lgdp $_{i,t}$	0.003	0.010	0.013	0.019
	(0.009)	(0.026)	(0.011)	(0.016)
pcrdgdp $_{i,t}$	0.002	0.014	-0.010	-0.033
	(0.006)	(0.042)	(0.008)	(0.026)
lassdep $_{i,t}$	0.022	0.048	0.038	0.041
	(0.019)	(0.042)	(0.024)	(0.026)
finopn $_{i,t}$	-0.022	-0.131	0.036	0.105
	(0.006) ***	(0.037) ***	(0.009) ***	(0.027) ***
TVendogenous				
natm $_{i,t}$	0.010	0.065	-0.010	-0.033
	(0.027)	(0.181)	(0.033)	(0.112)
d_natm $_{i,t}$	0.057	0.368	0.227	0.777
	(0.09)	(0.614)	(0.111) **	(0.378) **
TIexogenous				
dlowincome $_{i}$	-25.680	-2.561	12.453	-5.960
	(20.004)	(4.897)	(19.711)	(2.394) ***
pasaved $_{i}$	-1.937	-5.470	-1.050	-1.328
	(0.712) ***	(1.963) ***	(0.73)	(1.009)
d_pasaved $_{i}$	1.845	5.059	2.067	2.812
	(1.024) *	(2.785) *	(1.02) **	(1.386) **
discmid $_{i}$	-14.930	-2.107	-14.231	-0.952
	(8.562) *	(1.203) *	(8.463) *	(0.595)
d_discmid $_{i}$	15.432	2.110	18.214	1.279
	(13.998)	(1.977)	(13.75)	(0.971)
dischigh $_{i}$	-17.437	-2.481	-12.112	-0.785
	(8.936) **	(1.258) **	(8.82)	(0.623)
d_dischigh $_{i}$	15.230	2.092	15.935	1.109
	(14.947)	(2.112)	(14.593)	(1.031)
getcred $_{i}$	-0.199	-0.417	-0.102	-0.138
	(0.195)	(0.487)	(0.191)	(0.239)
d_getcred $_{i}$	0.277	0.571	0.267	0.396
	(0.297)	(0.798)	(0.289)	(0.39)
TIendogenous				
paelec $_{i}$	1.415	5.869	0.837	1.549
	(0.549) ***	(2.211) ***	(0.566)	(1.141)
d_paelec $_{i}$	-2.038	-7.358	-4.674	-9.804
	(1.786)	(7.239)	(1.729) ***	(3.517) ***
_cons	37.424	1.571	39.988	0.448
	(17.057) **	(1.085)	(16.849) **	(0.534)
No. of Observations	395	395	394	394
No. of Groups	62	62	62	62
Wald chi2(21)	68.760	68.550	58.070	58.120
Prob > chi2	0.000	0.000	0.000	0.000
sigma_u	15.833	2.236	14.803	1.046
sigma_e	3.235	0.457	3.872	0.274
rho	0.960	0.960	0.936	0.936

Note : TV refers to time varying; TI refers to time invariant. The estimators are based on the proposal by Housman and Taylor (1981) and by Amemiya and MaCurdy (1986). Standard errors are reported in parentheses. Wald chi2 and prob>chi2 represents the significance of the Housman-Taylor estimation model. p-values from the Wald tests in the outputs use t and F distributions instead of the large-sample normal and χ^2 distributions.
*, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Source: Author's calculation based on the data from WB's GFDD, Global Findex, GPSS, G20 Financial Inclusion Indicators and IMF's FAS, Financial Soundness Indicators database (IMF 2006).
Income Group: World Bank

Moreover, in column (6) and (8) for standardized models, the dummy ($d\_\ pasaved_i$) is weakly significant and positive, that is, greater savings in the past year leads to lower return on assets in high-income economies, and conversely, results into a higher return on assets in low-income economies as the summation of original and dummy variables is positive.

Furthermore, the dummy ($d\_\ getcred_i$) enters negatively and significantly, that is, making credit availability easier results in a lower percentage of interest margins to gross income in low-income countries as the total of original and dummy variable is negative.

Finally, $paelec_i$, which is the most focused variable in the estimation, is significantly positive in column (6) for the standardized model, meaning greater use of electronic payments for making payments leads to a higher percentage of return on assets in all the economies, irrespective of any income class.

In a nutshell, from Table 1c, the author finds $paloan_{i,t}$ to have a greater impact (summation of the both original and dummy variables' coefficient is 0.199 as against -0.114 in $getcred_i$) in the case of the percentage of interest margin to gross income for low-income economies. Additionally, $pasaved_i$ and $nbrn_{i,t}$ are found as the only variables having a difference in low-income economies in case of the return on assets, and return on equity, respectively.

4.2. Findings of the analysis

After analyzing the estimation results, this paper obtains several noticeable differences in the impacts of financial inclusion measures on financial stability indicators. Firstly, in general, without any income class segregation, it shows that a higher number of branches contributes to increased competition among the branches as the branches will become more aggressive on credit facilities which will increase the total loan base of the economy contributing to making the NPL percentage lower than before and at the same time, this aggressive credit facilities will reward banks with higher gross interest income even with a cost of lower return on assets and higher non-interest expenses to maintain those credits. Conversely, in low-income economies, increased credit facility driven by a competitive market might allow some under-standard loans requiring increased NPL provisions but might reward the branches with higher returns on equity.

In addition, having greater savings in the past year allows the financial market to a have better cushion against any adversity, which might relax the regulatory capital requirement in both high-income economies and low-income economies. Moreover, for both classes of economies, savings in the past year provided the financial market with huge liquidity to facilitate extensive credit facility making the relative NPL ratio lower compared to a higher credit base. However, extensive credit facilities might generate some unproductive credit facilities leading to reduced return on assets for branches in high-income economies as against some productive credit facilities contributing positively to the financial stability in low-income economies.

Furthermore, all economies, in general, using electronic payments for making payments makes the economy vulnerable to any financial adversity, requiring higher NPL provisions to capital. Making electronic payment easier might trigger the NPL ratio to go up as it supports meeting excessive demands for credit facility where there are higher credit risks involved, but ends up rewarding the financial markets with higher return on assets. On the contrary, in low-income economies, greater use of electronic payments facilitates financing the productive credit demands, which drives the economy to lower the regulatory capital adequacy requirements.

Table 1c. Housman-Taylor Estimation Results, 2010-2016
(Financial Stability Indicator Category: Earnings & Profitability)

	(6) Return on Assets, Percent ($roa_{i,t}$)		(7) Return on Equity, Percent ($roe_{i,t}$)		(8) Interest Margin to Gross Income, Percent ($intmarg_{i,t}$)		(9) Non-interest Expenses to Gross Income, Percent ($nintexp_{i,t}$)	
	Original Model	**Standardized Model**	**Original Model**	**Standardized Model**	**Original Model**	**Standardized Model**	**Original Model**	**Standardized Model**
Tvexogenous								
paloan $_{i,t}$	0.007	0.022	0.057	0.013	-0.322	-0.133	0.206	0.087
	(0.033)	(0.103)	(0.536)	(0.12)	(0.115) ***	(0.047) ***	(0.154)	(0.065)
d_paloan $_{i,t}$	0.062	0.217	1.054	0.285	0.817	0.332	-0.439	-0.179
	(0.108)	(0.343)	(1.591)	(0.358)	(0.486) *	(0.201) *	(0.664)	(0.28)
nbrn $_{i,t}$	-0.043	-0.401	-0.613	-0.399	0.278	0.328	0.433	0.533
	(0.019) **	(0.177) **	(0.301) **	(0.194) **	(0.077) ***	(0.092) ***	(0.104) ***	(0.127) ***
d_nbrn $_{i,t}$	0.064	0.692	1.803	1.358	-0.083	-0.082	0.081	0.096
	(0.058)	(0.552)	(0.857) **	(0.579) **	(0.258)	(0.314)	(0.353)	(0.437)
lgdp $_{i,t}$	-0.003	-0.030	-0.036	-0.027	-0.015	-0.020	0.001	0.001
	(0.004)	(0.045)	(0.077)	(0.055)	(0.014)	(0.018)	(0.019)	(0.025)
pcrdgdp $_{i,t}$	0.000	-0.011	-0.007	-0.017	0.008	0.024	-0.038	-0.112
	(0.003)	(0.069)	(0.053)	(0.083)	(0.01)	(0.029)	(0.013) ***	(0.04) ***
lassdep $_{i,t}$	-0.003	-0.022	-0.097	-0.048	-0.060	-0.061	-0.057	-0.055
	(0.009)	(0.067)	(0.149)	(0.079)	(0.03) **	(0.03) **	(0.04)	(0.04)
finopn $_{i,t}$	0.010	0.210	0.205	0.298	0.000	-0.001	0.006	0.017
	(0.003) ***	(0.055) ***	(0.046) ***	(0.066) ***	(0.009)	(0.023)	(0.012)	(0.031)
TVendogenous								
natm $_{i,t}$	-0.021	-0.493	-0.259	-0.415	-0.094	-0.286	0.054	0.170
	(0.012) *	(0.288) *	(0.208)	(0.342)	(0.041) **	(0.125) **	(0.055)	(0.171)
d_natm $_{i,t}$	0.007	0.142	-0.031	-0.114	0.139	0.440	-0.040	-0.146
	(0.039)	(0.917)	(0.652)	(1.069)	(0.137)	(0.419)	(0.185)	(0.574)
TIexogenous								
dlowincome $_{i}$	-1.792	3.154	-35.354	5.271	52.919	0.615	27.950	3.375
	(2.632)	(2.835)	(35.532)	(2.902) *	(18.921) ***	(2.216)	(28.012)	(3.298)
pasaved $_{i}$	-0.271	-2.570	-3.472	-2.314	0.688	0.905	1.739	2.085
	(0.133) **	(1.244) **	(2.001) *	(1.32) *	(0.736)	(0.899)	(1.07)	(1.334)
d_pasaved $_{i}$	0.344	3.060	3.211	1.783	-0.802	-1.089	-2.919	-3.558
	(0.191) *	(1.803) *	(2.905)	(1.931)	(1.05)	(1.283)	(1.526) **	(1.901) *
discmid $_{i}$	1.008	0.432	6.930	0.170	12.858	0.719	10.641	0.778
	(1.204)	(0.581)	(16.957)	(0.578)	(8.158)	(0.513)	(12.045)	(0.773)
d_discmid $_{i}$	-2.595	-1.289	-21.479	-0.824	-11.353	-0.657	-10.251	-0.740
	(1.948)	(0.95)	(27.918)	(0.962)	(13.206)	(0.837)	(19.538)	(1.264)
dischigh $_{i}$	-0.449	-0.280	-10.548	-0.425	14.788	0.840	16.503	1.159
	(1.205)	(0.58)	(16.613)	(0.564)	(8.422) *	(0.53)	(12.459)	(0.801)
d_dischigh $_{i}$	-0.075	-0.046	5.685	0.135	-2.503	-0.098	-14.130	-0.989
	(1.914)	(0.931)	(26.085)	(0.896)	(13.935)	(0.884)	(20.683)	(1.339)
getcred $_{i}$	-0.003	-0.035	-0.065	-0.020	0.546	0.560	0.071	0.194
	(0.024)	(0.211)	(0.327)	(0.202)	(0.181) ***	(0.204) ***	(0.268)	(0.309)
d_getcred $_{i}$	-0.025	-0.282	-0.813	-0.658	-0.623	-0.674	-0.369	-0.553
	(0.04)	(0.389)	(0.565)	(0.385) *	(0.28) **	(0.344) **	(0.414)	(0.518)
TIendogenous								
paelec $_{i}$	0.209	2.893	2.801	2.725	-0.423	-0.846	-1.234	-2.134
	(0.106) **	(1.45) **	(1.604) *	(1.546)	(0.577)	(1.028)	(0.836)	(1.52)
d_paelec $_{i}$	-0.047	0.340	2.831	4.543	0.079	0.558	3.645	6.478
	(0.331)	(4.739)	(4.943)	(4.987)	(1.835)	(3.4)	(2.663)	(5.027)
_cons	3.031	-0.126	38.599	0.080	11.811	-0.806	33.813	-0.864
	(2.298)	(0.485)	(31.37)	(0.467)	(16.153)	(0.457) **	(23.891)	(0.691)
No. of Observations	397	397	397	397	395	395	395	395
No. of Groups	62	62	62	62	62	62	62	62
Wald chi2(21)	35.310	35.440	34.760	34.810	50.550	49.070	35.790	36.430
Prob > chi2	0.026	0.025	0.030	0.030	0.000	0.001	0.023	0.020
sigma_u	1.648	0.798	20.169	0.677	14.015	0.890	21.088	1.371
sigma_e	1.513	0.732	25.545	0.858	4.900	0.311	6.586	0.428
rho	0.543	0.543	0.384	0.384	0.891	0.891	0.911	0.911

Note : TV refers to time varying; TI refers to time invariant. The estimators are based on the proposal by Housman and Taylor (1981) and by Amemiya and MaCurdy (1986). Standard errors are reported in parentheses. Wald chi2 and prob>chi2 represents the significance of the Housman-Taylor estimation model. p-values from the Wald tests in the outputs use t and F distributions instead of the large-sample normal and $\chi 2$ distributions.
*, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Source: Author's calculation based on the data from WB's GFDD, Global Findex, GPSS, G20 Financial Inclusion Indicators and IMF's FAS, Financial Soundness Indicators database (IMF 2006).
Income Group: World Bank

Lastly, increased private credit by deposit institutions allocates the total administrative cost over the loans, which lowers the non-interest expenses to the gross income of the financial market in all the economies, without any income class segregation. On the other hand, in general, having excessive liquid assets compared to deposits symbolizes the idleness of funds referring to the lower profitability of financial institutions. Conversely, a higher degree of financial openness contributes to a lower NPL ratio and higher return on assets and return on equity, at the same time, for all economies.

5. Conclusion

Financial inclusion is an integral part of economic development, which can be a shield for the underprivileged sections of the economy from being socially excluded. Because, poverty is not merely people's choice not to enter the financial services but rather the absence of people's right to have easy access to finance, including their ability to participate in the financial system. However, financial inclusion being a multidimensional concept is always scarce and inaccurate to measure, as the nature of financial systems nowadays all over the world is complex and heterogeneous.

This research work intended to examine the impact of financial inclusion on financial stability in low-income economies, more specifically, whether they are reciprocally supportive, mutually exclusive, or there is a substantial trade-off between them. Existing literature has not identified any unidirectional relationship between financial inclusion and financial stability, suggesting the relationship to be either positive or negative. According to the literature, financial inclusion facilitates with diversification of bank assets, less dependence on non-core financing sources i.e. debt, reduction of liquidity risks, and better transmission of monetary policy as against the negative impacts like degradation of credit standard supported by extensive credit facility, loss of financial sector reputation, and inadequate regulations to control the MFIs.

The mathematical computation depends on the availability of data which has been a prevalent limitation in this paper as found that most of the initially selected variables (see Appendix 1& 2) are sorted out (see Appendix 3) because of unavailability of data. Most of the targeted economies of point of interest in this paper do not provide structured financial inclusion or stability data for a long time. Nevertheless, this paper has selected the combination of determinants for both financial inclusion and financial stability in such a way that it has found 62 common economies out of the total dataset providing data for all the variables. Analyzing unbalanced panel data using the Hausman-Taylor model restricts the regressors from having endogenity biases with idiosyncratic error. Moreover, control variables employed in the model support the data to check collinearity within the explanatory variables.

In estimation, the author finds that ensuring financial inclusion by greater 'usage' and 'access' of the financial system contributes positively to the financial stability in the way of reducing the NPL ratio and higher gross inertest margin resulting from aggressive credit facility driven by a higher degree of competition, even at the cost of relatively lower return on assets and increased non-interest expenses to maintain those credit facilities in general, irrespective of any income class segregation. However, it might lead to lowering the NPL provisions to capital and return on equity to facilitate the excessive demand for loans in high-income economies. On the contrary, in low-income economies, the scenario might be different as the expansionary credit facility because of increased competition might permit under-standard loans leading the financial market to a vulnerable situation. This might lead the financial system in low-income economies to a higher NPL provisions to capital, even though might compensate with higher return on equity.

In addition, for all economies, in general, providing easy financial access and use of electronic payments to the economy, including underserved sections of the society enables the economy to have higher savings serving as a cushion against any financial adversity, in some cases, might lead to tightening the regulatory capital requirement. But, in low-income economies, providing enormous liquidity resulting from higher savings and increased use of electronic payments can facilitate the economy with extensive credit which, in turn, makes the NPL ratio look lower because of a higher credit base than before. On the other hand, though extensive credit facility allows some unproductive credits leading to a decreased return on assets for branches in high-income economies, it might support the low-income economies by fueling some productive economic activities. This paper also finds that financial inclusion by expansionary credit facilities is positive for low-income economies if the financial market is not burdened with idle liquid assets obtained from higher savings.

As mentioned earlier, the measures of both financial inclusion and financial stability are not unarguable in this paper because of the unavailability of data. So, future research work could consider including some more measures of both financial inclusion and financial stability. Moreover, the effects of financial inclusion on financial stability in the financial crisis period should be considered separately.

Appendices

Appendix 1. Indicators' set for Financial Inclusion

Indicator's Name	Dimension	Source
% of adults having account at a formal financial institution	Usage	WB's Global Financial Development Database (GFDD)
Deposit accounts with commercial banks per 1,000 adults	Usage	IMF Financial Access Survey
Depositors with commercial banks per 1,000 adults	Usage	IMF Financial Access Survey
% of adults with at least one loan outstanding from a regulated financial institution	Usage	IMF Financial Access Survey (Own Calculation)
Number of Borrowers at commercial banks per 1,000 adults	Usage	IMF Financial Access Survey
Number of Insurance Policy Holders per 1000 adults	Usage	IMF Financial Access Survey (Own Calculation)
% of adults used electronic payments to make payments	Usage	WB's Global Financial Development Database (GFDD)
% of adults use their mobile device to make payment	Usage	WB's Global Financial Development Database (GFDD)
% of adults having active mobile money accounts	Usage	IMF Financial Access Survey (Own Calculation)
% of adults saved at a financial institution in the past year	Usage	WB's Global Financial Development Database (GFDD)
% of adults used accounts to receive remittances	Usage	WB's Global Financial Development Database (GFDD)
% of SMEs with an account at commercial banks	Usage	IMF Financial Access Survey (Own Calculation)
% of SMEs with outstanding loan or line of credit	Usage	IMF Financial Access Survey (Own Calculation)
Number of SMEs with outstanding loans / Number of total outstanding loans	Usage	IMF Financial Access Survey (Own Calculation)
SME outstanding loans as a proportion of Total Outstanding Loans of Commercial Bank	Usage	IMF Financial Access Survey (Own Calculation)
Number of SME borrowers as a proportion of the total number of borrowers from Commercial Banks	Usage	IMF Financial Access Survey (Own Calculation)
Number of Branches of financial institution per 100,000 adults	Access	IMF Financial Access Survey (Own Calculation)
Number of Automated Teller Machines (ATMs) per 100,000 adults	Access	IMF Financial Access Survey
Number of POS terminals per 100,000 adults	Access	WB Global Payments System Survey (GPSS) (Own Calculation)
Number of e-money accounts for mobile payments	Access	WB Global Payments System Survey (GPSS)
Number of mobile money accounts registered	Access	IMF Financial Access Survey
Financial Knowledge Score	Quality	G20 Financial Inclusion Indicators
% of adults having main source of emergency funding from own savings	Quality	G20 Financial Inclusion Indicators
Disclosure index combining existence of a variety of disclosure requirements (count data 0-5)	Quality	G20 Financial Inclusion Indicators
Index reflecting the existence of formal internal and external dispute resolution mechanisms	Quality	G20 Financial Inclusion Indicators
% of SMEs with a proportion of loans requiring collateral	Quality	WB Enterprise Surveys
Getting Credit: Distance to Frontier	Quality	G20 Financial Inclusion Indicators
% of firms identifying access to finance as a major constraint	Quality	WB's Global Financial Development Database (GFDD)
Value of collateral needed for a loan (% of the loan amount)	Quality	WB's Global Financial Development Database (GFDD)
Lerner index	Quality	WB's Global Financial Development Database (GFDD)

Appendix 2. Financial Soundness Indicators (According to the IMF 2006)

Indicator's Name	Category	Source
DEPOSIT TAKERS (DTs)		
Regulatory Capital to Risk-Weighted Assets, Percent	Capital Adequacy	IMF's Financial Soundness Indicators Database
Regulatory Tier 1 Capital to Risk-Weighted Assets, Percent	Capital Adequacy	IMF's Financial Soundness Indicators Database
Non-performing Loans Net of Provisions to Capital, Percent	Capital Adequacy	IMF's Financial Soundness Indicators Database
Capital to Assets, Percent	Capital Adequacy	IMF's Financial Soundness Indicators Database
Large Exposures to Capital, Percent	Capital Adequacy	IMF's Financial Soundness Indicators Database
Non-performing Loans to Total Gross Loans, Percent	Asset Quality	IMF's Financial Soundness Indicators Database
Sectoral Distribution of Total Loans (Deposit-taker) Percent	Asset Quality	IMF's Financial Soundness Indicators Database
Gross Asset Position in Financial Derivatives to Capital, Percent	Asset Quality	IMF's Financial Soundness Indicators Database
Return on Assets, Percent	Earnings and Profitability	IMF's Financial Soundness Indicators Database
Return on Equity, Percent	Earnings and Profitability	IMF's Financial Soundness Indicators Database
Interest Margin to Gross Income, Percent	Earnings and Profitability	IMF's Financial Soundness Indicators Database
Non-interest Expenses to Gross Income, Percent	Earnings and Profitability	IMF's Financial Soundness Indicators Database
Liquid Assets to Total Assets (Liquid Asset Ratio), Percent	Liquidity	IMF's Financial Soundness Indicators Database
Liquid Assets to Short Term Liabilities, Percent	Liquidity	IMF's Financial Soundness Indicators Database
Customer Deposits to Total (Non-interbank) Loans, Percent	Liquidity	IMF's Financial Soundness Indicators Database
Net Open Position in Foreign Exchange to Capital, Percent	Exposure to Foreign Exchange Risk	IMF's Financial Soundness Indicators Database
Foreign-Currency-Denominated Loans to Total Loans, Percent	Exposure to Foreign Exchange Risk	IMF's Financial Soundness Indicators Database
Foreign-Currency-Denominated Liabilities to Total Liabilities, Percent	Exposure to Foreign Exchange Risk	IMF's Financial Soundness Indicators Database
Spread Between Reference Lending and Deposit Rates, Basis Points	Exposure to Interest rate risk	IMF's Financial Soundness Indicators Database
Spread Between Highest and Lowest Interbank Rate, Basis Points	Exposure to Interest rate risk	IMF's Financial Soundness Indicators Database
OTHER FINANCIAL CORPORATIONS (OFCs)		
OFC's Assets to Total Financial System Assets, Percent		IMF's Financial Soundness Indicators Database
OFC's Assets to Gross Domestic Product (GDP), Percent		IMF's Financial Soundness Indicators Database
NON-FINANCIAL CORPORATIONS (NFCs)		
Total Debt to Equity, Percent		IMF's Financial Soundness Indicators Database
Return on Equity, Percent		IMF's Financial Soundness Indicators Database
Earnings to Interest and Principal Expenses, Percent		IMF's Financial Soundness Indicators Database
Net Foreign Exchange Exposure to Equity, Percent		IMF's Financial Soundness Indicators Database
HOUSEHOLDS (HHs)		
Household Debt to Gross Domestic Product (GDP), Percent		IMF's Financial Soundness Indicators Database
Household Debt Service and Principal Payments to Income, Percent		IMF's Financial Soundness Indicators Database
MARKET LIQUIDITY		
Average Bid-Ask Spread in the Securities Market, Percent		IMF's Financial Soundness Indicators Database
Average Daily Turnover Ratio in the Securities Market, Percent		IMF's Financial Soundness Indicators Database
REAL ESTATE MARKETS		
Residential Real Estate Loans to Total Loans, Percent		IMF's Financial Soundness Indicators Database
Commercial Real Estate Loans to Total Loans, Percent		IMF's Financial Soundness Indicators Database

Appendix 3. Definition and category of elected variables

Broad Category of Variables	Name of Variables	Dimensions	Definition of Variables
Financial Inclusion	$paloan_{i,t}$	***Usage***	% of adults with at least one loan outstanding from a regulated financial institution
	$pasaved_{i}$		% of adults saved at a financial institution in the past year
	$paelec_{i}$		% of adults used electronic payments to make payments
	$nbrn_{i,t}$	***Access***	Number of Branches of financial institution per 100,000 adults
	$natm_{i,t}$		Number of Automated Teller Machines (ATMs) per 100,000 adults
	$discmid_{i}$	***Quality***	Disclosure index combining existence of a variety of disclosure requirements (count data 1-3)
	$dischigh_{i}$		Disclosure index combining existence of a variety of disclosure requirements (count data 4-5)
	$getcred_{i}$		Getting Credit: Distance to Frontier
Control Variables	$lgdp_{i,t}$		log of GDP per capita
	$pcrdgdp_{i,t}$		Private credit by deposit institute and other financial institutions to GDP, %
	$lassdep_{i,t}$		Liquid assets to deposits and short term fund, %
	$finopn_{i,t}$		Financial Openness
Financial Stability	$rcrwa_{i,t}$	***Capital Adequacy***	Regulatory Capital to Risk-Weighted Assets, Percent
	$t1rwa_{i,t}$		Regulatory Tier 1 Capital to Risk-Weighted Assets, Percent
	$nplprov_{i,t}$		Non-performing Loans Net of Provisions to Capital, Percent
	$npl_{i,t}$	***Asset Quality***	Non-performing Loans to Total Gross Loans, Percent
	$roa_{i,t}$	***Earnings and Profitability***	Return on Assets, Percent
	$roe_{i,t}$		Return on Equity, Percent
	$intmarg_{i,t}$		Interest Margin to Gross Income, Percent
	$nintexp_{i,t}$		Non-interest Expenses to Gross Income, Percent
	$liqass_{i,t}$	***Liquidity***	Liquid Assets to Total Assets (Liquid Asset Ratio), Percent
	dlowincome		Dummy variable indiacting income group classification based on the definition of World Bank 2018. Using the WB Income group definition, this paper classifies the economies having GNI per capita $3,895 or less as 'Low-income economies' and the economies having $3,896 or above as 'High-income economies'. The dummy takes value '1' when the economy falls in 'low-income economies' class, otherwise takes value '0' for 'high-income economies'.

Conflict of Interest

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Tables

Table A1. Descriptive Statistics (Original Model)

Variable	Obs	Mean	Std. Dev.	Min	Max
paelec	434	31.06	28.07	1.17	97.84
dlowincome	434	0.34	0.47	0.00	1.00
pasaved	434	23.18	19.22	1.23	78.41
discmid	434	0.31	0.46	0.00	1.00
dischigh	434	0.42	0.49	0.00	1.00
getcred	434	58.00	18.91	8.25	91.00
paloan	430	1.84	6.50	0.00	47.47
nbrn	429	20.77	18.84	0.50	116.17
natm	429	53.84	47.92	0.51	288.63
lgdp	434	22.64	20.61	2.42	76.65
pcrdgdp	429	57.11	46.11	3.48	260.70
lassdep	430	31.30	15.53	6.07	127.97
finopn	418	9.51	41.92	0.21	391.50
rcrwa	425	16.89	3.67	1.75	30.46
t1rwa	425	14.77	3.71	2.18	30.23
nplprov	423	18.94	35.80	-28.97	413.56
npl	424	6.86	7.08	0.15	49.90
roa	426	1.33	2.07	-25.61	6.44
roe	426	11.59	29.78	-505.64	65.40
intmarg	424	59.45	15.75	7.39	93.55
nintexp	424	59.74	15.39	24.37	115.79
liqass	423	28.37	14.15	4.99	74.97

Source: Author's calculation based on the data from WB's GFDD, Global Findex, GPSS, G20 Financial Inclusion Indicators, and IMF's FAS, Financial Soundness Indicators database (IMF 2006).

Table A2. Descriptive Statistics (Standardized Model)

Variable	Obs	Mean	Std. Dev.	Min	Max
sd_paelec	434	0.00	1.00	-1.07	2.38
dlowincome	434	0.34	0.47	0.00	1.00
sd_pasaved	434	0.00	1.00	-1.14	2.87
discmid	434	0.31	0.46	0.00	1.00
dischigh	434	0.42	0.49	0.00	1.00
sd_getcred	434	0.00	1.00	-2.63	1.75
sd_paloan	430	0.00	1.00	-0.28	7.02
sd_nbrn	429	0.00	1.00	-1.08	5.07
sd_natm	429	0.00	1.00	-1.11	4.90
sd_lgdp	434	0.00	1.00	-0.98	2.62
sd_pcrdgdp	429	0.00	1.00	-1.16	4.42
sd_lassdep	430	0.00	1.00	-1.62	6.22
sd_finopn	418	0.00	1.00	-0.22	9.11
sd_rcrwa	425	0.00	1.00	-4.13	3.70
sd_t1rwa	425	0.00	1.00	-3.40	4.17
sd_nplprov	423	0.00	1.00	-1.34	11.02
sd_npl	424	0.00	1.00	-0.95	6.08
sd_roa	426	0.00	1.00	-13.03	2.47
sd_roe	426	0.00	1.00	-17.37	1.81
sd_intmarg	424	0.00	1.00	-3.31	2.17
sd_nintexp	424	0.00	1.00	-2.30	3.64
sd_liqass	423	0.00	1.00	-1.65	3.29

Source: Author's calculation based on the data from WB's GFDD, Global Findex, GPSS, G20 Financial Inclusion Indicators, and IMF's FAS, Financial Soundness Indicators database (IMF 2006).

Table A3. Correlations of the variables (Original Model)

Variable	paelec	dlowi~e	pasave	discmid	dischigh	getcred	paloan	nbrn	natm	lgdp	pcrdgdp	lassdep	finopn	rcrwa	t1rwa	nplprov	npl	roa	roe	intmarg	nintexp	liqass
paelec	1																					
dlowincome	-0.548	1																				
pasaved	0.9183	-0.4234	1																			
discmid	0.0509	-0.098	0.0912	1																		
dischigh	0.1564	-0.2718	0.0952	-0.5713	1																	
getcred	0.3586	-0.4091	0.3105	0.1376	0.0715	1																
paloan	0.0607	-0.0707	0.0496	0.3358	-0.1821	0.0242	1															
nbrn	0.316	-0.3858	0.1984	-0.0886	0.1324	0.2798	-0.027	1														
natm	0.5701	-0.5197	0.4377	0.3067	0.0462	0.376	0.3785	0.4457	1													
lgdp	0.0774	0.0118	0.0637	0.041	-0.0398	0.0586	-0.019	0.0038	0.039	1												
pcrdgdp	0.386	-0.2705	0.3925	-0.0869	0.0512	0.274	0.0153	0.3274	0.251	0.0571	1											
lassdep	0.1578	0.0511	0.1587	-0.0923	-0.0051	-0.1785	-0.072	-0.017	-0.059	-0.118	-0.0721	1										
finopn	-0.007	0.0495	-0.009	-0.1222	-0.0237	-0.0986	-0.057	0.0213	-0.065	-0.06	0.1973	0.2204	1									
rcrwa	-0.145	0.1796	-0.174	-0.0233	0.0543	0.0034	0.0072	-0.192	-0.219	-0.008	-0.1664	0.1949	0.1776	1								
t1rwa	-0.182	0.2896	-0.194	-0.1058	-0.0012	-0.1017	-0.068	-0.164	-0.292	0.0223	-0.1912	0.2173	0.1925	0.8898	1							
nplprov	0.1147	-0.0773	0.0199	-0.1363	0.0259	0.0518	-0.097	0.4031	0.0529	-0.016	0.3469	0.0198	0.027	-0.16	-0.086	1						
npl	-0.26	0.1612	-0.375	-0.1344	-0.0767	-0.0522	-0.178	0.2039	-0.12	-0.026	0.0197	-0.0406	0.0397	0.0295	0.0883	0.7006	1					
roa	-0.325	0.1999	-0.225	-0.0509	-0.0018	-0.2298	0.0698	-0.385	-0.335	-0.087	-0.3362	0.0372	-0.13	0.1755	0.166	-0.4729	-0.361	1				
roe	-0.175	0.0921	-0.057	-0.0411	0.0308	-0.2317	0.0538	-0.353	-0.236	-0.063	-0.2586	0.0282	-0.112	0.019	0.0315	-0.4941	-0.435	0.8992	1			
intmarg	0.0541	0.0892	0.092	-0.1415	0.1002	0.1203	-0.218	0.146	0.0807	-0.037	0.1347	-0.1451	-0.031	-0.032	0.0627	0.1225	0.0319	-0.188	-0.166	1		
nintexp	0.2899	-0.0473	0.1691	0.0436	0.0923	0.0224	0.0886	0.1372	0.1476	0.0085	0.0185	0.1668	0.1198	-0.008	0.0103	0.1619	0.083	-0.336	-0.359	0.0031	1	
liqass	-0.08	0.192	-0.092	-0.2704	-0.0503	-0.1897	-0.03	-0.103	-0.082	0.0137	-0.1911	0.2117	0.2941	0.1412	0.2325	-0.021	0.1475	-0.034	-0.059	0.0283	0.0382	1

Source: Author's calculation based on the data from WB's GFDD, Global Findex, GPSS, G20 Financial Inclusion Indicators, and IMF's FAS, Financial Soundness Indicators database (IMF 2006).

Table A4. Correlations of the variables (Standardized Model)

Variable	sd_paelec	dlowincome	sd_pasaved	discmid	dischigh	sd_getcred	sd_paloan	sd_nbrn	sd_natm	sd_lgdp	sd_pcrdgdp	sd_lassdep	sd_finopn	sd_rcrwa	sd_tlrwa	sd_nplprov	sd_npl	sd_roa	sd_roe	sd_intmarg	sd_nintexp	sd_liqass
sd_paelec	1																					
dlowincome	-0.548	1																				
sd_pasaved	0.9183	-0.4234	1																			
discmid	0.0509	-0.098	0.0912	1																		
dischigh	0.1564	-0.2718	0.0952	-0.5713	1																	
sd_getcred	0.3586	-0.4091	0.3105	0.1376	0.0715	1																
sd_paloan	0.0607	-0.0707	0.0496	0.3358	-0.1821	0.0242	1															
sd_nbrn	0.316	-0.3858	0.1984	-0.0886	0.1324	0.2798	-0.027	1														
sd_natm	0.5701	-0.5197	0.4377	0.3067	0.0462	0.376	0.3785	0.4457	1													
sd_lgdp	0.0774	0.0118	0.0637	0.041	-0.0398	0.0586	-0.019	0.0038	0.039	1												
sd_pcrdgdp	0.386	-0.2705	0.3925	-0.0869	0.0512	0.274	0.0153	0.3274	0.251	0.0571	1											
sd_lassdep	0.1578	0.0511	0.1587	-0.0923	-0.0051	-0.1785	-0.072	-0.017	-0.059	-0.118	-0.0721	1										
sd_finopn	-0.007	0.0495	-0.009	-0.1222	-0.0237	-0.0986	-0.057	0.0213	-0.065	-0.06	0.1973	0.2204	1									
sd_rcrwa	-0.145	0.1796	-0.174	-0.0233	0.0543	0.0034	0.0072	-0.192	-0.219	-0.008	-0.1664	0.1949	0.1776	1								
sd_tlrwa	-0.182	0.2896	-0.194	-0.1058	-0.0012	-0.1017	-0.068	-0.164	-0.292	0.0223	-0.1912	0.2173	0.1925	0.8898	1							
sd_nplprov	0.1147	-0.0773	0.0199	-0.1363	0.0259	0.0518	-0.097	0.4031	0.0529	-0.016	0.3469	0.0198	0.027	-0.16	-0.086	1						
sd_npl	-0.26	0.1612	-0.375	-0.1344	-0.0767	-0.0522	-0.178	0.2039	-0.12	-0.026	0.0197	-0.0406	0.0397	0.0295	0.0883	0.7006	1					
sd_roa	-0.325	0.1999	-0.225	-0.0509	-0.0018	-0.2298	0.0698	-0.385	-0.335	-0.087	-0.3362	0.0372	-0.13	0.1755	0.166	-0.4729	-0.361	1				
sd_roe	-0.175	0.0921	-0.057	-0.0411	0.0308	-0.2317	0.0538	-0.353	-0.236	-0.063	-0.2586	0.0282	-0.112	0.019	0.0315	-0.4941	-0.435	0.8992	1			
sd_intmarg	0.0541	0.0892	0.092	-0.1415	0.1002	0.1203	-0.218	0.146	0.0807	-0.037	0.1347	-0.1451	-0.031	-0.032	0.0627	0.1225	0.0319	-0.188	-0.166	1		
sd_nintexp	0.2899	-0.0473	0.1691	0.0436	0.0923	0.0224	0.0886	0.1372	0.1476	0.0085	0.0185	0.1668	0.1198	-0.008	0.0103	0.1619	0.083	-0.336	-0.359	0.0031	1	
sd_liqass	-0.08	0.192	-0.092	-0.2704	-0.0503	-0.1897	-0.03	-0.103	-0.082	0.0137	-0.1911	0.2117	0.2941	0.1412	0.2325	-0.021	0.1475	-0.034	-0.059	0.0283	0.0382	1

Source: Author's calculation based on the data from WB's GFDD, Global Findex, GPSS, G20 Financial Inclusion Indicators, and IMF's FAS, Financial Soundness Indicators database (IMF 2006).

Figures

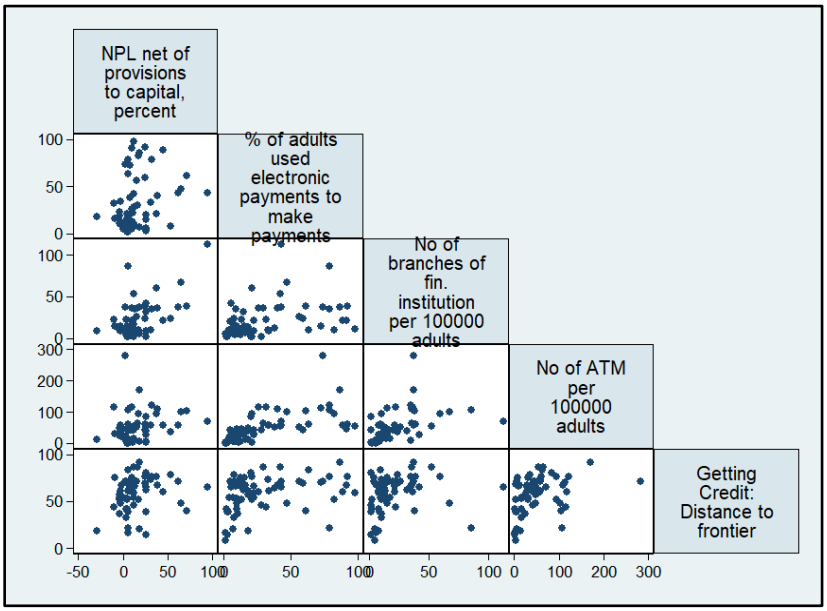

Figure 1. Non-performing loans net of provisions to capital versus percentage of adults used electronic payments for making payments, number of branches of financial institution per 100000 adults, number of ATM per 100000 adults, and getting credit: distance to frontier.

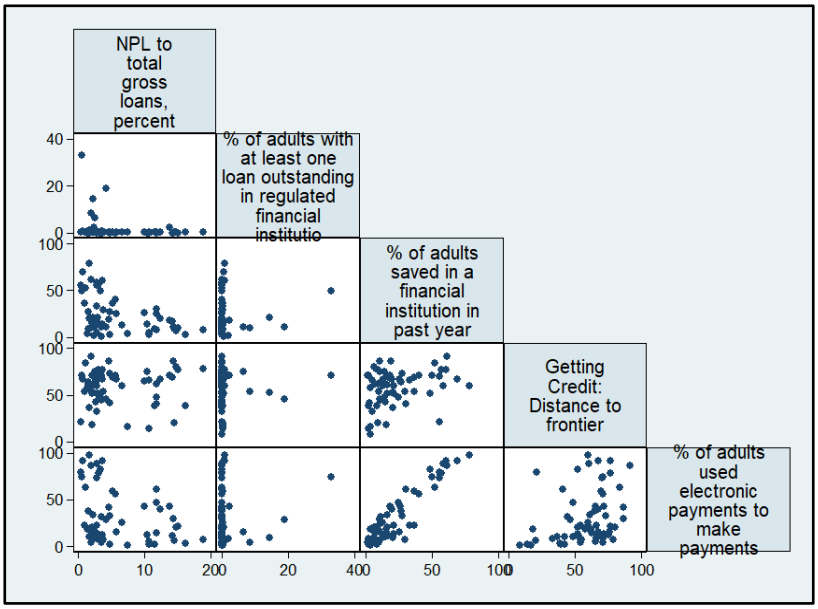

Figure 2. Non-performing loans to total gross loans versus percentage of adults having at least one outstanding in regulated financial institutions, percentage of adults saved in the past year, getting credit: distance to frontier, and percentage of adults used electronic payments for making payments.

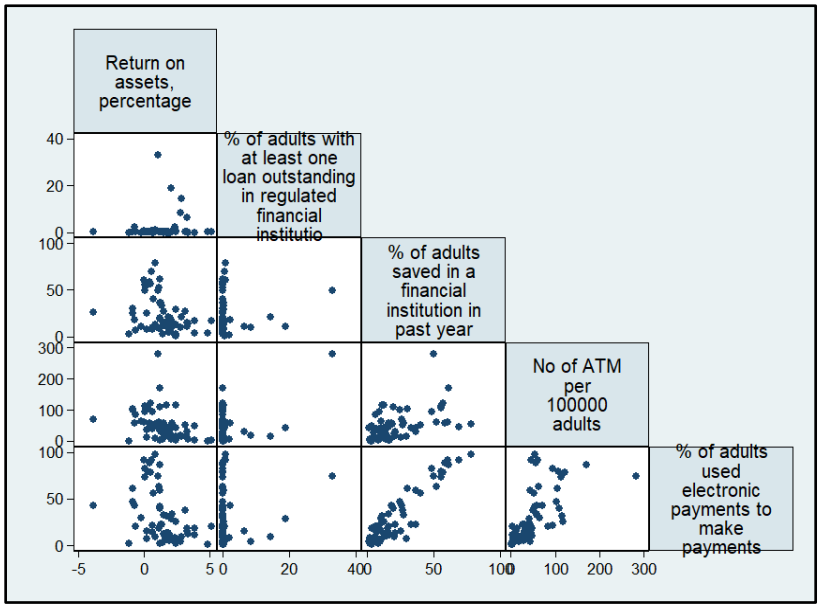

Figure 3. Return on assets versus percentage of adults having at least one outstanding in regulated financial institutions, percentage of adults saved in the past year, number of ATMs per 100,000 adults, and percentage of adults used electronic payments for making payments.

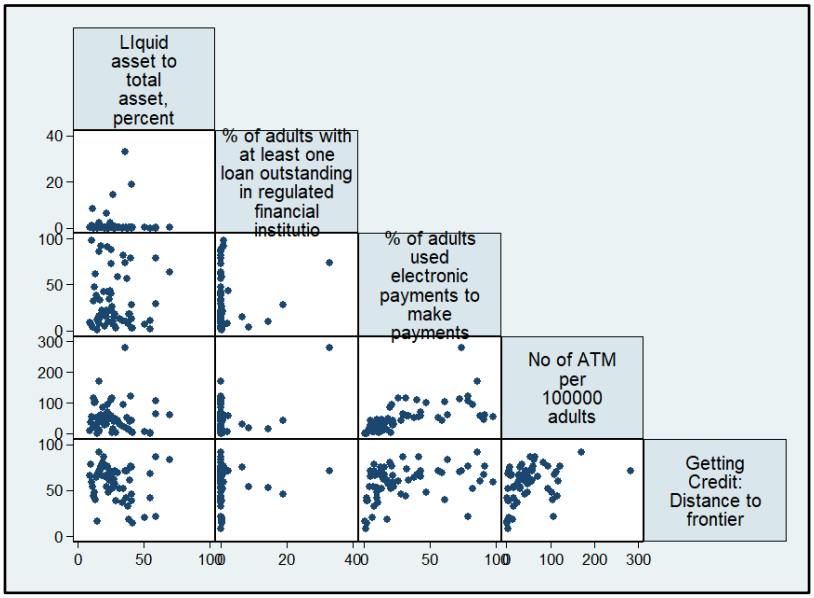

Figure 4. Liquid assets to total assets versus percentage of adults having at least one outstanding in regulated financial institutions, percentage of adults used electronic payments for making payments, number of ATMs per 100,000 adults, and getting credit: distance to frontier.