On the Relationship between Financial Inclusion and Bank Performance

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ABSTRACT

This study examines the relationship between various financial inclusion measures and banks' performance across multiple countries with varying institutional, regulatory, and income levels. To construct an aggregate bank performance index, we employ principal component analysis, which utilises a set of critical indicators summarised by the CAMEL rating system, including banks' solvency, asset quality, efficiency, profitability, and liquidity. Our primary findings indicate that different measures of financial inclusion exhibit varying associations with bank performance. Specifically, there is a trade-off between bank performance and credit deepening, especially in high income nations. Conversely, in low income nations, higher financial inclusion, measured by deposits to GDP, number of deposits, and number of borrowers, does not affect bank performance adversely. Banks in low income nations could achieve significant gains by improving financial access and enhancing regulatory environments.

Keywords: Financial Inclusion; Bank Performance; CAMEL Ratios; Cross-Country Analysis; High and Low Income Countries

***JEL* Classification:** G21, G28, O57

Declarations of Interest: None

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1 Introduction

Financial inclusion refers to the accessibility of affordable and useful financial services and products for individuals and businesses according to their specific needs. This objective has gained significant importance recently, being a critical driver for eight of the Sustainable Development Goals (SDGs) 2030, including poverty reduction and economic growth.

The COVID-19 pandemic has further highlighted the significance of financial inclusion, with restrictions on movement and business operations leading to increased demand for remote access to financial services. In this context, banks played a vital role in providing government aid and implementing monetary policies, but their reach to vulnerable groups depends on access to formal financial services. Digital financial services, in particular, have become essential during limited physical interaction (Ayadi and Sha'ban, 2020). Notably, the World Bank Group reports that global account ownership has reached 76 per cent, with 71 per cent of individuals in developing countries accessing financial services (Demirguc-Kunt et al., 2022).

The literature on the relationship between financial inclusion and bank performance is relatively scarce and focuses mainly on the stability dimension of performance and generally provides mixed evidence. One view is that financial inclusion can enhance banks' stability as broader financial access to bank deposits improves diversification in the funding base and mitigates correlated deposit withdrawals during crisis times (Han and Melecky, 2013); however, the economic viability of providing deposit accounts to the poor is still questionable (Markose et al., 2022). On access to credit, when credit growth is rapid or obtained by lowering the loan portfolio's quality, the relationship between financial inclusion in terms of credit expansion and stability can be negative (Mehrotra and Yetman, 2015; Sahay et al., 2015b; Beck et al., 2018).

This paper sets out to explore the link between financial inclusion and CAMEL-based bank performance index (hereafter referred to as 'bank performance', see for more details Section 3.1).[5] Additionally, we check for potential variation in the relationship across countries characterised by different level of income. We attempt to answer two key research questions: Is greater financial inclusion accompanied by an improvement or a decline in bank performance? Is the relationship between financial inclusion and performance different for banks operating in high income countries compared to low income countries?

With our study, we make several contributions to the existing literature. First, we construct an aggregate index of banks' performance based on CAMEL ratings using principal component analysis. We then use the index to examine the relationship between financial inclusion and bank performance at the country level. The CAMEL rating framework is a method used by supervisory authorities in many countries around the world that provides a comparable measure of different aspects of bank performance that is not focused solely on profitability and margins. The main advantage is that it allows addressing the interrelation between multiple dimensions of bank performance.

Second, we examine the relationship between alternative measures of financial inclusion and bank performance for different countries based on their income, distinguishing between high and low income countries (where the former includes high and upper middle income countries and is referred to as "high income countries" hereafter, and the latter includes lower middle and low income countries and is referred to as "low income countries" hereafter).[6] Additionally, we explore the relationship for different economies based on their level of income

[5] Although microfinance institutions and other Fintech providers have a significant role in advancing financial inclusion, we focus on banks as these institutions are the most capable in terms of infrastructure, outreach, in addition to being highly regulated and transparent.

[6] The World Bank classifies economies based on estimates of gross national income (GNI) per capita. As of 1 July 2016, low income economies are defined as those with a GNI per capita of $1,025 or less in 2015; lower middle income economies are those with a GNI per capita between $1,026 and $4,035; upper middle income economies are those with a GNI per capita between $4,036 and $12,475; high income economies are those with a GNI per capita of $12,476 or more.

inequality. Research has shown a strong correlation between inequality in using formal accounts and general income inequality (Demirguc-Kunt and Klapper, 2012). We also perform additional tests distinguishing between countries by the level of financial exclusion, estimating the incremental effect of the regulatory environment, and testing alternative measures of financial inclusion related to the geographical outreach aspect of inclusion.

Our evidence shows that various financial inclusion measures are associated differently with CAMEL-based bank performance measures. The entire sample shows a trade-off between bank performance and credit deepening suggesting that focusing on enhancing financial inclusion through excessive credit growth may lead to a decline in banks' performance. We find that the advantages of financial inclusion for bank performance seem to materialise in low income countries, where banks tend to hold higher levels of capital and liquidity. In contrast, performance benefits from financial inclusion seem to be exhausted in high income countries, possibly due to the already high levels of financial inclusion in these countries (Ahamed et al., 2018). Our results indicate that banks operating in countries with sufficient capital supervision and/or low income inequality levels could benefit more from financial inclusion.

Regarding geographical outreach, we find a positive correlation between the number of ATMs and bank performance in high income countries, and the number of branches and bank performance in low income countries. Overall, our findings support the efforts towards increasing financial inclusion, particularly in low income countries; one of the main policy recommendations of this paper is that promoting financial inclusion should be associated with improvements in the regulatory supervision and inequality.

The remainder of the paper is structured as follows. Section 2 provides selected literature review on financial inclusion and develops the main hypotheses. Section 3 presents the data and descriptive statistics. Section 4 presents the empirical model. Section 5 presents and discusses the results. Finally, Section 6 concludes.

2 Selected literature review and hypotheses development

2.1 Importance of financial inclusion

There are many benefits associated with financial inclusion, particularly in terms of greater access to financial services as this creates opportunities for starting up new businesses and improving poor households' income, which in turn has been found to be beneficial for GDP and productivity (Duvendack and Mader, 2020; Kuada, 2019). The Consultative Group to Assist the Poor (CGAP) has identified financial inclusion as a key enabler for a number of SDGs (Klapper, 2016).[7] Because of this, particularly in emerging economies, national governments have been encouraging banks to take a proactive role in enhancing access to financial services.[8] While this strategy requires initial investments, there are also many benefits, as banks reach new customers in their local communities. If and to what extent greater financial inclusion impacts bank profitability and soundness is an important empirical research question. The relationship is multifaceted and it is reasonable to expect a significant variation in the impact of financial inclusion on banking sectors across countries. The level of a country's income is important in determining the relationship, as literature finds that the contribution of financial development to stability and other macro-economic indicators differs across income levels, suggesting that high income countries may have reached the stage of diminishing benefits from further development (De Gregorio and Guidotti, 1995; Sahay et al., 2015a).

There are also drawbacks to financial inclusion. Some studies have found that it may lead to over-indebtedness for micro-borrowers with low returns on investments, in case of using loans for non-productive sources; this is particularly true for borrowers with low financial

[7] The CGAP is a global partnership of more than 30 leading development organizations that works to advance the lives of poor people through financial inclusion. CGAP identifies financial inclusion as an enabler for reducing poverty, reducing hunger, improving health and wellbeing, achieving gender equality, promoting economic growth and decent jobs, supporting industry, innovation and infrastructure, fostering quality education, and reducing inequality.

[8] For example, the Pradhan Mantri Jan Dhan Yojana (PMJDY) has been a game changer in the banks' role in financial inclusion in India (Markose et al., 2022).

literacy (Schicks, 2014). Other studies find a non-linear relationship between finance and growth (Arcand et al., 2015; Beck et al., 2014; Panizza, 2018; Xu and Gui, 2021).

In a recent systematic 'review of reviews' on the impact of financial inclusion on economic, social, gender and behavioural outcomes, Duvendack and Mader (2020) find that overall the effects are more likely to be positive than negative. Barajas et al. (2020) point to the need to encourage bank competition and channel government payments through bank accounts to foster financial inclusion; the authors also highlight the need to identify and address frictions that hinder financial inclusion.

2.2 Bank performance index

Several methods have been used by regulators and researchers to construct a single quantitative measure to capture the overall performance of the banking system. It can be an aggregate measure based on a weighted average of performance indicators, such as for example Kočišová (2014) who construct an aggregate banking stability index for the European Union (EU) countries using four performance indicators: capital adequacy, asset quality, earnings, and liquidity. The author assigns equal weights to all indicators, indicating equal importance of these indicators in measuring banks' stability. Similarly, the financial strength index (FSI) used by the Central Bank of the Republic of Turkey consists of asset quality, liquidity, exchange rate risk, interest rate risk, profitability, and capital adequacy, which are equally weighted in the index (CBRT, 2006). The same six indicators are used by the Bank of Albania (2010) and Gersl and Hermanek (2007) to construct an aggregate banking stability index / financial strength index for the Republic of Albania and Czech Republic, respectively, but the weights assigned to the indicators are based on expert judgements. Similarly, Ginevičius and Podviezko (2013) construct an index to evaluate the soundness and stability of commercial banks in the Republic of Lithuania. The authors use the CAMEL approach to evaluate five categories of bank soundness indicators: capital, asset quality, efficiency, profitability, and

liquidity; the weights are obtained by taking an average value of the weights assigned by seven experts in the Republic of Lithuania. This approach is also used by Mishra et al. (2013) who construct a banking stability index for the Republic of India using CAMEL ratios.

The closest study to our analysis in terms of the index construction is by Petrovska and Mihajlovska (2013) who construct an aggregate banking stability index for the Republic of North Macedonia using a weighted sum approach on banks' financial soundness indicators. These indicators represent insolvency risk, credit risk, profitability, efficiency, liquidity risk, and currency risk. They are adjusted and normalised, with the resulting index closer to its maximum value of one indicating lower risk. The authors also construct a financial condition index using a principal component analysis, which provides a signal for the financial system's health. Similarly, Dumičić (2016) use a principal component analysis to construct two indices for the Republic of Croatia: a systemic risk accumulation index and an index reflecting the consequences of systemic risk materialisation.

In this paper, we construct an aggregate index of bank performance focusing on CAMEL indicators using a principal component analysis (PCA). We choose the CAMEL rating framework as it provides a uniform and objective measure of banks' performance (Gaul et al., 2021) combining the main important aspects including stability, profitability, and liquidity (Hirtle et al., 2020; National Credit Union Administration, 2021). Using the index allows addressing the interrelation between these multiple dimensions of bank performance (Sahajwala and Van den Bergh, 2000). Our choice to construct the index using PCA is motivated by limiting the problem of exogenous or equal weight assignment used to construct the previously discussed indicators.

2.3 Hypotheses development: Financial inclusion and bank performance

Banks play a major role in advancing financial inclusion, providing individuals and businesses with the opportunity to deal with rule-based regulated financial institutions with

higher transparency (Rahman, 2014). However, theoretical and empirical studies tend to have contradicting views on the relationship between financial inclusion and bank performance, including profitability and solvency. In addition, the relationship may differ depending on whether one looks at it from the deposits or loans perspective.

Several policy papers provide arguments for the potential positive impact of financial inclusion linked to deposits on bank performance. This is because banks' reliance on a diversified base of retail deposits can reduce volatility and lower the impact of a crisis, and the fact that compared to other providers of funding depositors have a steady and predictable behaviour in normal times (Khan, 2011; Mehrotra andYetman, 2015; Rahman, 2014). Empirically, Han and Melecky (2013) offer evidence of a positive effect of broader financial inclusion in terms of access to bank deposits on financial stability measured by stability of deposit growth during the 2008 financial crisis. Ahamed and Mallick (2019) find that financial inclusion contributes to a more stable banking system, pronounced when banks are mostly funded by deposits and operate within a strong institutional environment, rule of law, and political stability.

Financial inclusion has also been found to be a means for financial institutions to enhance performance by achieving scale efficiency and earning higher returns (Deng and Elyasiani, 2008; Khan, 2011; Prasad, 2010). However, the economic viability of providing deposit accounts to the poor is still questionable (Markose et al., 2022). The empirical research by Dietrich and Wanzenried (2014) provides evidence that banks can increase their profits by increasing deposits; they show that faster growing banks in terms of deposits are better able to expand their business and convert deposits into high earning assets. Hence, we hypothesise that a higher degree of financial inclusion in terms of deposits is likely to be associated with a stronger performance of the banking system. Hence our first hypothesis can be formulated as follows:

H1. The relationship between financial inclusion in terms of deposit accounts and bank performance is positive and significant.

In terms of financial inclusion linked to loans, the literature provides mixed arguments. On the one hand, financial inclusion through lending could expose banks to additional risks from low income groups (Hannig and Jansen, 2010). If financial institutions lower their credit standards to increase financial inclusion by excessive credit expansion, it might reduce the quality of their lending portfolio and negatively affect their asset quality, profitability, and solvency (Beck et al., 2018; Dell'Ariccia and Marquez, 2006; Khan, 2011; Mehrotra and Yetman, 2015). Overlooking the creditworthiness of borrowers may lead to a financial crisis and the financial system may not be sustained (Rajan, 2010). Empirically, Sahay et al. (2015b) find a negative relationship between an increased number of borrowers and banks' stability; however, the relationship depends crucially on the stringency of bank regulation and supervision. Similarly, Feghali et al. (2021) find that access to credit has a negative impact on stability if credit growth occurs without due consideration of borrowers' ability to repay. Demirgüç-Kunt and Detragiache (2005) show that countries with high credit exposure or high lagged credit growth are more vulnerable to a banking crisis related to risky assets and solvency issues. In the same vein, Dabla-Norris et al. (2015) indicate that lowering collateral requirements and costs of monitoring to increase financial inclusion in terms of credit access can result in higher non-performing loans in the banking sector posing instability risk. Schularick and Taylor (2012) also find that rapid expansions in credit are often precursors to financial crises.

In terms of the relationship between financial inclusion and profitability the literature is limited. Issaka Jajah et al. (2020) find, using a composite index of financial inclusion and different measures of profitability for banks in Sub-Saharan Africa, that the relationship is positive and significant; however, when using a "full world" sample the results are negative

and significant. The literature provides more evidence related to financial depth measures. Specifically, Demirgüç-Kunt and Huizinga (1999) conclude that countries with high financial development (measured by credit deepening) also have high competition which may be associated with lower profitability as banks have lower prices in competitive markets. Acharya et al. (2009) provide evidence of a negative relationship between financial development and banks' liquidity as financial development is accompanied by greater ease of getting external finance which in turn lowers the attractiveness of holding liquid assets.

On the other hand, some argue that financial inclusion through lending improves the assets side of banks' balance sheets by contributing to a more diversified loan base. Small frequent loans are less likely to cause aggregate loan losses or threaten the systemic health compared to large infrequent ones, and banks can earn profits by reaching out for the poor with small size loans (Cull and Morduch, 2007; Cull et al., 2012; Rahman, 2014). Adasme et al. (2006) and Morgan and Pontines (2018) provide empirical evidence to support this argument with a focus on SMEs. They show that increased lending to SMEs results in decreased probability of defaults and lower NPLs. In this paper we do not focus on SMEs lending, and typically for banks to increase financial inclusion through lending credit standards and collateral requirements might be reduced, which might have a negative impact on different aspects of bank performance. Hence, we conjecture that a higher degree of financial inclusion in terms of loans is likely to be negatively associated with bank performance. This hypothesis can be formulated as follows:

H2. The relationship between financial inclusion in terms of loan accounts and bank performance is negative and significant.

We are also interested in assessing the relationship between financial inclusion and bank performance across countries with different income levels. We expect that the impact of financial inclusion differs across countries with different characteristics (in terms of

development, income, existing level of financial inclusion, education, etc.) and that these characteristics might play an intermediate role in the relationship (Čihák et al., 2016). Sahay et al. (2015a) find that emerging economies can benefit from higher financial development (including financial deepening, access, and efficiency) to enhance financial stability and growth; however, in developed economies further financial access and development can increase the banking system's instability. Other studies suggest that the relationship between financial inclusion and bank performance depends on the income group the country belongs to. Dietrich and Wanzenried (2014) show that the determinants of banks' profitability vary significantly across countries with different income level. They also find that deposits growth and financial development positively impact banks' profitability, mainly in low income countries. Hence, our third hypothesis states that the relationship between financial inclusion and bank performance varies across countries with different characteristics.

H3. The relationship between financial inclusion and bank performance varies significantly across income regions and other country characteristics.

3 Data, variables, and descriptive statistics

Our sample period spans 2005 to 2014. To construct the sample, we start with 184 countries with available data on aggregate bank performance indicators from the Global Financial Development Database (GFDD). We then augment the sample with financial inclusion data obtained from the Financial Access Survey (FAS) and macroeconomic data obtained from the World Development Indictors (WDI). We drop countries with missing data on financial inclusion and arrive at the final sample of 131 countries. Of those, 88 countries are classified by the World Bank as high income or upper middle income and 43 countries as low income or lower middle income.[9] Our final sample contains 1,124 country-year observations.

[9] The countries included in the sample and their income classification are listed in Appendix A.

3.1 Bank performance index

We start by constructing an index (*Bank performance index*) that captures banks' overall performance using the principal component analysis.[10] The index uses selected quantitative indicators from the CAMEL ratios. The choice of indicators follows the extant literature (e.g., Ginevičius and Podviezko, 2013; Mishra et al., 2013) and represents the following five aspects of bank performance: (i) profitability (*Profitability)* measured by return on assets; (ii) solvency (*Solvency*) proxied by the regulatory capital to risk-weighted assets ratio; (iii) asset quality (*Asset Quality*) captured by the non-performing loans to gross loans ratio; (iv) liquidity (*Liquidity*) measured by the liquid assets to deposits and short-term funding ratio; and (v) efficiency (*Efficiency*) proxied by the cost to income ratio.[11]

We normalise the performance indicators, with their normalised value representing the deviation from the limit values (minimum – maximum) in each country. To account for sample heterogeneity in terms of the factors that can impact the overall bank performance, we first split the sample into high and low income countries and then use principal components to extract the factors. The results of PCA show that in both sub-samples efficiency and profitability contribute to the first component. Solvency and asset quality contribute to the second component, whereas liquidity contributes to the third component in high income countries. As for low income countries, liquidity contribute to the second component and solvency to the third component.[12] The scores of the components are then estimated to construct a single bank performance index. As a final step, the index is normalised and converted into percentage.

[10] The details of the construction of the bank performance index are provided in Appendix B.
[11] When constructing the performance index, the indicators that have an opposite direction with performance (i.e., asset quality and efficiency) are adjusted by taking the reciprocal value so that a higher value indicates better performance.
[12] The results of PCA for high income and low income countries are presented in Appendix B.

3.2 Financial inclusion indicators

We use alternatively four indicators of financial inclusion: (i) outstanding deposits with commercial banks as a percent of GDP (*Deposits to GDP*), (ii) outstanding loans from commercial banks as a percent of GDP (*Loans to GDP*), (iii) number of deposit accounts with commercial banks per 1000 adults (*Number of deposits*), and (iv) number of borrowers from commercial banks per 1000 adults (*Number of borrowers*).[13] These are the main traditional indicators of financial inclusion that represent its use and depth dimensions and are commonly used in the literature (Sarma, 2008; Sha'ban et al., 2020).[14]

We expect the financial inclusion indicators related to deposits to have a positive relationship with bank performance (*H1*); by widening the deposit base banks might benefit from a more stable funding and greater scale economies posing positive effects on their solvency, efficiency, and profitability. Conversely, we expect financial inclusion indicators related to loans to have a negative relationship with bank performance (*H2*); increased credit access can result in higher credit risk for banks posing negative effects on their asset quality, solvency, and profitability.

3.3 Control variables

A set of country-specific variables is included in all models as controls. Specifically, we include GDP growth (*GDP growth*) to account for economic fluctuations. It is expected to have a positive relationship with bank performance as banks face less risk and generate higher profits when the economic growth is higher (Pasiouras and Kosmidou, 2007). Benign economic conditions related to higher economic growth increase the demand for banks' services; however adverse economic conditions can increase poor quality loans and negatively affect

[13] Recent studies focus on constructing a financial inclusion index to capture its composite nature (Camara and Tuesta, 2014; Ghosh and Sahu, 2021; Sha'ban et al., 2020; Singh and Yadava, 2022), however, in our study the focus is on each individual financial inclusion indicator.

[14] The first two financial inclusion indicators, namely outstanding deposits to GDP and outstanding loans to GDP, are also considered to be credit deepening and financial development measures.

bank performance (Albertazzi and Gambacorta, 2009). We also include inflation (*Inflation*) as an economic indicator. The effect of inflation on bank performance depends on the banks' ability to anticipate future inflation and adjust their interest rates accordingly (Perry, 1992).

To control for the banking sector characteristics, we use the Lerner index (*Lerner index*) as a measure of market power and competition. This indicator has an ambiguous effect on bank performance as the empirical literature provides evidence of two streams: the traditional competition-fragility view states that banks in competitive markets have lower pricing power that leads to lower profitability, higher risk taking, and hence lower performance (Al-Gasaymeh et al., 2023; Keeley, 1990; Marcus, 1984), whereas the competition-stability view suggests that lower competition and higher market power allow banks to become too-big-to-fail and thus increase their risk taking motivated by government safety nets (Boyd and De Nicolo, 2005).

We also control for a country's population density (*Population density*). Its effect can be positive if higher population increases banks' business opportunities and hence increases profitability. On the contrary, it can be negative if these business opportunities attract higher competition and hence lower profit margins (Dietrich and Wanzenried, 2009).[15][16]

4 Empirical model

To analyse the link between financial inclusion and bank performance at a country level (*H1* and *H2*), we use the following baseline regression model:

$$\begin{aligned} \boldsymbol{PI_{ct}} = \; & \boldsymbol{\beta_0} + \boldsymbol{\beta_1 Financial\ inclusion_{ct-1}} + \boldsymbol{\beta_2 GDP\ growth_{ct}} + \boldsymbol{\beta_3 Inflation_{ct}} \\ & + \boldsymbol{\beta_4 Lerner\ index_{ct}} + \boldsymbol{\beta_5 Population\ density_{ct}} + \boldsymbol{c_c} + \boldsymbol{c_t} + \boldsymbol{u_{ct}} \end{aligned} \quad (1)$$

[15] This indicator is usually linked to the banking sector capacity and might influence the costs of financial services distribution (Beck and Feyen, 2013).
[16] Appendix C reports the definition of the variables as well as the data sources used in the study.

where the dependent variable PI_{ct} is the bank performance index of country *c* at time *t*. Our main variable of interest, $Financial\ inclusion$, is measured alternatively as: (i) deposits to GDP, (ii) loans to GDP, (iii) number of deposits, and (iv) number of borrowers, all lagged by one year to control for endogeneity issues. Control variables include GDP growth, inflation, Lerner index, and population density. The model includes country and time fixed effects (c_c and c_t, respectively) to account for heterogeneity across time and regions which may be correlated with the independent variables. Standard errors are clustered at the country level to control for serial correlation of errors and heteroscedasticity (Petersen, 2009). The model is estimated using ordinary least squares (OLS).

Next, we divide the countries into high income and low income groups to examine whether there is variation in the relationship between financial inclusion and bank performance across the two groups (*H3*). To test this, we estimate the baseline regression in Equation (1) replacing the financial inclusion indicator with two interaction terms: (i) between the financial inclusion indicator (lagged by one year) and high income dummy ($Financial\ inclusion_{ct-1} * High\ income\ dummy_{ct}$) and (ii) between the financial inclusion indicator (lagged by one year) and the low income dummy ($Financial\ inclusion_{ct-1} * Low\ income\ dummy_{ct}$):

$$\begin{aligned} \boldsymbol{PI_{ct}} = \ & \boldsymbol{\beta_0} + \boldsymbol{\beta_1 Financial\ inclusion_{ct-1} * High\ income\ dummy_{ct}} \\ & + \boldsymbol{\beta_2 Financial\ inclusion_{ct-1} * Low\ income\ dummy_{ct}} \\ & + \boldsymbol{\beta_3 GDP\ growth_{ct}} + \boldsymbol{\beta_4 Inflation_{ct}} + \boldsymbol{\beta_5 Lerner\ index_{ct}} \\ & + \boldsymbol{\beta_6 Population\ density_{ct}} + \boldsymbol{c_c} + \boldsymbol{c_t} + \boldsymbol{u_{ct}} \end{aligned} \quad (2)$$

We perform a number of additional tests as part of *H3*. First, we examine the impact of the level of income inequality in the country on the financial inclusion and bank performance relationship. To capture income inequality, we use the Gini index (obtained from the World Bank data) that measures the extent to which the distribution of income among individuals or households within an economy deviates from a perfectly equal distribution. To distinguish

between countries with high and low levels of income inequality, we create a low inequality dummy variable that is equal to 1 if the country's Gini index is below its sample mean value and zero otherwise ($Low\ inequality\ dummy$).[17] We then use the baseline model in Equation (1) adding an interaction term between the financial inclusion indicator (lagged by one year) and the low inequality dummy variable ($Financial\ inclusion_{ct-1} * Low\ inequality\ dummy_{ct}$).

In the second additional test, we examine if there is variation in the relationship between financial inclusion and bank performance depending on the level of financial inclusion in the country. We do so by constructing a dummy variable for the high level of financial inclusion that is equal to one if the value of the financial inclusion indicator is above its mean value for the full sample and zero otherwise (*High financial inclusion dummy*), and a dummy variable for the low level of financial inclusion that is equal to one if the value of the financial inclusion indicator is below its mean value for the full sample and zero otherwise ($Low\ financial\ inclusion\ dummy$). We use the baseline regression Equation (1) replacing the financial inclusion indicator with two interaction terms: (i) between the financial inclusion indicator (lagged by one year) and high level of financial inclusion dummy variable ($Financial\ inclusion_{ct-1} * High\ financial\ inclusion\ dummy_{ct}$), and (ii) between the financial inclusion indicator (lagged by one year) and the low level of financial inclusion dummy variable ($Financial\ inclusion_{ct-1} * Low\ financial\ inclusion\ dummy_{ct}$). We estimate the model for the full sample, and separately for the high income and low income sub-samples to test if the existing level of financial inclusion has a different impact on the relationship between financial inclusion and bank performance across countries with different levels of income.

[17] Gini index ranges between 0 (perfect income equality) and 100 (perfect income inequality).

In the third additional test we are interested in the impact of the regulatory environment of the country on the relationship between financial inclusion and bank performance. The main regulatory variable we use is the bank capital regulation index constructed by Barth et al. (2013)[18]. To distinguish between countries with high and low levels of capital regulation stringency, we create a dummy variable that is equal to 1 if the country's capital regulation index is above its mean value and zero otherwise ($Stringent\ capital\ regulation\ dummy$). We then use the baseline model in Equation (1) adding an interaction term between the financial inclusion indicator (lagged by one year) and the stringent capital regulation dummy variable ($Financial\ inclusion_{ct-1} * Stringent\ capital\ regulation\ dummy_{ct}$).

We also test alternative measures of financial inclusion in our fifth additional test using the baseline model Equation (1). Specifically, we examine the geographical outreach aspect of financial inclusion measured by the number of ATMs and branches in the country.[19]

5 Results

5.1 Descriptive statistics

Table 1 provides descriptive statistics for the main variables used in the study for the full sample, by income region, and the difference in means tests.

< Insert Table 1 about here>

[18] The index measures the stringency of capital regulation in the country and ranges from 0 to 10. The data are available for 2003, 2007, and 2011; we therefore fill in the missing years in our sample with the index data of the preceding date. For example, if the index score for a certain country was 4 in 2003, we fill in the years 2004-2006 with the same score (i.e., 4).

[19] We also test the relationship between financial inclusion and component performance measures: profitability, solvency, asset quality, liquidity, and efficiency. The results indicate a negative and statistically significant association between loans to GDP and banks' profitability, a significant negative association between loans to GDP and number of borrowers and banks' solvency, a negative association between deposits to GDP and asset quality, and a positive and significant association between the number of deposits and banks' efficiency. Full results are available upon request.

The data show relatively high variation in bank performance and financial inclusion indicators in the sample. In terms of performance, the sample mean for the performance index is 54.6%. Banks generate around 1.4% after tax returns on their assets, they are reasonably efficient (their costs on average account for 58.3% of their income), well capitalised (their mean regulatory capital ratio is 16.7%) and liquid (they hold on average 36.7% of their deposits and short-term funding as liquid assets), while their non-performing loans constitute, on average, around 5.9% of total loans.[20]

As for the financial inclusion indicators, the largest variation is observed in deposits to GDP with a minimum value of around 2.2% (Congo) and the maximum value of around 479.7% (Luxembourg), followed by loans to GDP with a minimum value of around 0.7% (Liberia) and a maximum value of around 318.6% (Hong Kong, China). The same applies to the other financial inclusion indicators: the number of deposit accounts per 1000 adults varies from only 1.6 (Cameroon) to 7824.9 (Japan) with an average of 1138.5; the number of borrowers in the banking system (around 183.5 per 1000 adults) is on average lower than that of depositors but still shows a relatively large variation among the countries in the sample. The macroeconomic and banking market characteristics also show significant variation across the sample countries.

Comparing high and low income countries, the data show that while the difference in means in the bank performance index is insignificant, banks headquartered in low income countries seem to have higher profitability, capital, and liquidity, whereas banks in high income countries show better asset quality and efficiency. High income countries seem to have, on average, a significantly higher level of financial inclusion. As for the control variables, low income countries have a higher GDP growth which is expected as these economies have the

[20] The non-performing loans to gross loans maximum value of 45.3% is observed in Mauritania in 2010.

potential to grow faster utilising mechanisms and technologies already provided and utilised by developed countries.[21]

5.2 Regression analysis

5.2.1 Financial inclusion and bank performance index

Table 2 reports the results of estimating Equation (1). Models (1), (3), (5), and (7) test the relationship between financial inclusion measured by deposits to GDP, loans to GDP, number of deposit accounts, and number of borrowers, respectively, and bank performance measured by the aggregate performance index. Models (2), (4), (6), and (8) additionally control for a set of country-specific variables. All models are estimated on the full sample using ordinary least squares (OLS) with country and time fixed effects; in all regression estimations we use standard errors clustered at the country level.

< Insert Table 2 about here>

We find that deposits to GDP, number of deposits, and number of borrowers have no significant effect on our aggregated measure of bank performance. However, Models (3) and (4) show a significant negative association between banks' loans to GDP and the performance index (confirming *H2*). These results indicate that there might be a trade-off between financial inclusion and bank performance, when higher financial inclusion is achieved through excessive credit growth and lower credit standards and hence poorer asset quality. This is consistent with Demirgüç-Kunt and Detragiache (2005) and Sahay et al. (2015b) who also find evidence suggesting a trade-off between increased credit / number of borrowers and bank performance. As suggested by Dabla-Norris et al. (2015) and Khan (2011), increased lending can be

[21] Appendix D reports the results of the correlation analysis.

associated with increased informational inefficiencies and operating costs leading to deterioration in bank performance.

In line with our expectations, GDP growth is positively and significantly related to bank performance, as banks face lower risks and increase their activity in terms of customer deposits and loans when the economic growth is high, which in turn positively impacts their interest margins, profitability, and stability (Pasiouras and Kosmidou, 2007; Petria et al., 2015).[22] There is a highly positive and significant relationship between Lerner index and bank performance, providing evidence for the competition-fragility theory, where higher market power enables banks to generate monopoly profits (Beck et al., 2006; Molyneux and Thornton, 1992); also this result can be explained by the assumption that larger banks with higher market power are better able to exploit economies of scale and pass on to customers potential inefficiencies (Flamini et al., 2009).[23]

5.2.2 High versus low income countries

We next test whether there is variation in the relationship between financial inclusion and bank performance depending on the country's income group.

< Insert Table 3 about here>

Results reported in Table 3 show that high income countries mainly drive the estimated negative relationship between financial inclusion and bank performance. Specifically, Model (2) shows a significant negative association between loans to GDP and the performance index in high income countries. This financial inclusion measure is also a proxy for credit deepening and financial development; well-developed economies tend to have a high level of financial

[22] Model (8) shows a negative association between inflation and bank performance which is expected only if banks are unable to anticipate future inflation and adjust their interest rates accordingly (Perry, 1992).
[23] The population density variable is mostly insignificant except for Model (6) where the inclusion variable is measured by the number of deposit accounts.

inclusion, so it might be suboptimal for banks in these countries to increase their financial inclusion as this might require lowering their credit standards. Hence, it seems that in high income countries bank performance gains from financial inclusion might be exhausted. On the other hand, banks in low income countries could achieve some performance gains from further financial inclusion by extending the number and volume of deposits and the number of loans, as shown by the positive and significant coefficients on the corresponding variables with the low income dummy.

Our evidence suggests that a country's income level has an important impact on the relationship between financial inclusion and bank performance (confirming *H3*). We find that financial inclusion is positively related to bank performance in low income countries. These economies have the need and scope for greater financial inclusion that in turn would have a positive impact on the banking sector. This is consistent with Sahay et al. (2015a) who find that emerging economies can benefit from greater financial inclusion and development in terms of enhancing financial stability and growth, Dietrich and Wanzenried (2014) who show that the determinants of banks' profitability vary significantly across countries with different income levels, and Dabla-Norris et al. (2015) who find that the impact of financial inclusion on macroeconomic indicators such as economic growth and income inequality depends on country characteristics and differs between high, middle, and low income countries.

5.2.3 Additional tests

5.2.3.1 Income inequality

As an additional test, we examine whether the inequality of income in a country has an impact on the relationship between financial inclusion and bank performance.

< Insert Table 4 about here>

Model (2) in Table 4 shows that low income inequality in a country lowers the negative association between loans to GDP and bank performance. Model (4) reveals a stronger positive effect of the number of borrowers on bank performance in countries with lower income inequality. We therefore suggest that improvements in a country's income inequality can enhance the relationship between financial inclusion and bank performance, and that banks operating in countries with low income inequality can benefit more from financial inclusion. This could be due to borrowers' enhanced ability to repay credit in countries with lower levels of income inequality as these countries will offer more equal opportunities and healthier social and economic conditions.

5.2.3.2 High versus low financial inclusion

Next, we examine whether there is variation in the relationship between financial inclusion and bank performance depending on the country's existing financial inclusion level.

< Insert Table 5 about here>

Table 5 reports the estimation results. The results for the full sample (Models (1)-(4)) are similar to the baseline regression results (Table 2), with a negative and significant relationship between bank loans to GDP and bank performance for both high and low levels of financial inclusion. The results by income level (Models (5)-(12)) show that while the negative relationship between financial inclusion in terms of lending and bank performance holds for high income countries regardless of their prevailing financial inclusion level (Model (6)), it is the low income countries with low financial inclusion (Models (9)-(11)) that seem to drive the positive relationship between financial inclusion and bank performance in low income countries (Table 3). Hence, banks in these countries might achieve gains from increased financial inclusion.

5.2.3.3 Stringency of capital regulation

We proceed to test whether the stringency of capital regulation impacts the relationship between financial inclusion and bank performance. The results in Table 6 show that stringent capital regulatory environment has a positive impact on the relationship between financial inclusion and bank performance. Specifically, Models (1) and (2) show that stringent capital regulation in a country lowers the negative association between deposits to GDP and loans to GDP and bank performance, whereas Models (3) and (4) indicate a positive effect of the number of depositors and borrowers on bank performance when the stringency of capital regulation is high. This is largely in line with Sahay et al. (2015b) who find a positive relationship between financial inclusion and bank stability only in countries with stringent regulation.

< Insert Table 6 about here>

The results of this test imply that banks operating in countries with strong capital supervision can achieve more gains from financial inclusion, which may be due to the fact that capital buffers can mitigate the risks associated with increased expansion of banking services (particularly credit risk). As suggested by Sahay et al. (2015b), it is recommended that promoting financial inclusion be associated with improvements in regulatory supervision.

5.2.3.4 Alternative **measures of financial inclusion**

We next consider alternative measures of financial inclusion by focusing on its geographical outreach aspect (Issaka Jajah et al., 2020; Mialou et al., 2017; Sha'ban et al., 2020). We estimate the baseline regression (Equation (1)) replacing the previous four financial inclusion indicators with: (i) bank branches per 1000 km² and (ii) ATMs per 1000 km². We also test whether there is variation in the relationship between these measures of financial inclusion and bank performance depending on the country income group.

The results in Table 7 reinforce our baseline results, where financial inclusion measures relate differently to bank performance and the country income level has an important impact on the relationship. Specifically, we find that while the number of banks' branches per 1000 km² has no significant effect on bank performance for the full sample (Model (1)), it is positively and significantly associated with bank performance in low income countries (Model (3)). Turning to the number of ATMs per 1000km^2, we find that it is positively related to bank performance for the full sample (Model (2)), and that this result is driven by high income countries (Model (4)). Overall, this evidence suggests that banks can benefit from expanding geographical outreach, by increasing the number of branches in low income countries and the number of ATMs in high income countries.

< Insert Table 7 about here>

Overall, our findings suggest that country characteristics such as the level of income, income inequality, level of financial inclusion, and stringency of capital regulation impact the relationship between financial inclusion and bank performance. We also show that the type of the financial service used to improve financial inclusion matters.

6 Conclusions

In this study, we investigate the correlation between financial inclusion and bank performance, which we measure by an index constructed using a principal component analysis and quantitative indicators related to CAMEL ratios. Our analysis employs different financial inclusion measures, and we find that the outcomes vary depending on the indicator used. The results indicate a trade-off between bank performance and credit deepening, confirming our hypothesis (H2). Meanwhile, other financial inclusion indicators show no significant association with bank performance for the full sample, rejecting our hypothesis (H1).

Furthermore, we explore whether a country's income level affects the relationship between financial inclusion and bank performance. Our findings suggest that the advantages of financial inclusion for bank performance are more pronounced in low income countries where banks typically have higher capital and liquidity. In contrast, bank performance gains from financial inclusion appear negligible in high income countries. We perform a number of additional tests to gain more insights into the conditions that underlie the relationship between financial inclusion and bank performance. We find that banks operating in countries with lower levels of income inequality and financial inclusion and higher capital stringency can achieve more gains from financial inclusion. These results confirm that certain country characteristics impact the relationship between financial inclusion and bank performance (confirming *H3*). Additionally, we test alternative measures of financial inclusion related to geographical outreach, and find that banks can achieve performance gains from expanding their geographical outreach through branches in low income countries and through ATMs in high income countries.

The findings of this study have several policy implications. In particular, they indicate that the advantages of advancing financial inclusion in low income countries extend beyond improving economic and social development and can also influence banks' performance. Therefore, we recommend that policymakers promote basic banking activities in these countries, such as deposits and loans. Conversely, a strong emphasis on credit deepening in high income countries could heighten banks' risk and impair their performance. As a result, financial inclusion in these countries can be accomplished through non-profit organisations, such as credit unions, or by utilising existing post offices. We contend that the connection between financial inclusion and bank performance depends on various country characteristics, including income, inequality, and regulatory environment. Thus, policymakers should consider these characteristics when formulating policies promoting financial inclusion.

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Data Reference:

The data that support the findings of this study are openly available:

IMF FAS at:

https://data.imf.org/?sk=E5DCAB7E-A5CA-4892-A6EA-598B5463A34C

GFDD at:

https://www.worldbank.org/en/publication/gfdr/data/global-financial-development-database

WDI at:

https://databank.worldbank.org/source/world-development-indicators

Appendix A: Sample countries and their income classification

Table A1: Sample countries and their income classification

High income	Upper middle income	Lower middle income	Low income
Argentina	Albania	Armenia	Cambodia
Australia	Algeria	Bangladesh	Guinea
Austria	Azerbaijan	Bhutan	Mozambique
Bahrain	Belarus	Bolivia	Rwanda
Belgium	Bosnia and Herzegovina	Burundi	Sierra Leone
Brunei Darussalam	Botswana	Cameroon	Tanzania
Canada	Brazil	Congo, Rep.	Uganda
Chile	Bulgaria	Djibouti	
Croatia	China	Egypt, Arab Rep.	
Cyprus	Colombia	El Salvador	
Czech Republic	Costa Rica	Georgia	
Denmark	Dominican Republic	Ghana	
Estonia	Ecuador	Guatemala	
Finland	Gabon	Honduras	
France	Grenada	India	
Germany	Jordan	Indonesia	
Greece	Kazakhstan	Kenya	
Hong Kong SAR, China	Lebanon	Kyrgyz Republic	
Hungary	Macedonia, FYR	Lesotho	
Iceland	Malaysia	Mauritania	
Ireland	Maldives	Moldova	
Israel	Mauritius	Morocco	
Italy	Mexico	Nigeria	
Japan	Namibia	Pakistan	
Korea, Rep.	Panama	Philippines	
Kuwait	Paraguay	Samoa	
Latvia	Peru	Senegal	
Lithuania	Romania	Sri Lanka	
Luxembourg	Serbia	Swaziland	
Macao SAR, China	South Africa	Tajikistan	
Malta	St. Vincent and the Grenadines	Ukraine	
Netherlands	Thailand	Uzbekistan	
New Zealand	Tunisia	Vanuatu	
Norway	Turkey	Vietnam	
Oman	Turkmenistan	Yemen, Rep.	
Poland		Zambia	
Portugal			
Qatar			
Russian Federation			
Saudi Arabia			
Seychelles			
Singapore			
Slovak Republic			
Slovenia			
Spain			
Sweden			
Switzerland			
Trinidad and Tobago			
United Arab Emirates			
United Kingdom			
United States			
Uruguay			
Venezuela, RB			

Appendix B: Bank performance index construction

All the performance indicators are normalised through empirical normalisation to have a common scale ranging from 0 to 1:

$$\boldsymbol{I_{itc}^{n}} = \frac{\boldsymbol{I_{itc} - Min\ (I_{ic})}}{\boldsymbol{Max\ (I_{ic}) - Min\ (I_{ic})}} \quad (3)$$

where I_{itc} is the value of the indicator *i* in period *t* for country *c*. $Min\ (I_{ic})$ and $Max\ (I_{ic})$ are the minimum and maximum value, respectively, for the indicator for a country in the analysed period. The normalised value represents each indicator's deviation from its minimum and maximum values in each country. A higher value within the [0; 1] range indicates better bank performance.

Next, principal components are used to extract the factors that determine bank performance for each subsample separately i.e. high and low income countries. The results of PCA for high income and low income countries are presented in the table below.

Table B1: Principal components estimates

	PCA high income countries			**PCA low income countries**		
	Component1	**Component2**	**Component3**	**Component1**	**Component2**	**Component3**
Eigen value	1.53	1.11	0.93	1.58	1.07	1.03
% of variance	25%	24%	23%	32%	22%	21%
Variable						
Profitability	**0.5757**		0.3545	**0.6452**		
Solvency		**0.8008**				**0.897**
Asset quality		**-0.5946**		0.4024	-0.4508	-0.4054
Liquidity			**0.8375**		**0.872**	
Efficiency	**0.7849**			**0.6411**		
Total explained variation = 72%				'Total explained variation = 75%		

Note: The table reports results from using a principal component analysis on sub-samples of high (and upper middle) income countries and low (and lower middle) income countries. The results for each component include Eigen values, share of explained variation, and loadings from original variables. Bold figures show high loadings from the variable. A reciprocal of the asset quality and efficiency variables are used in the construction of the bank performance index.

Appendix C: Variable definitions

Table C1: Variable definitions

Variables	Definition	Source
Bank performance		
Bank performance index	An aggregate banking performance indicator at country level ranging from 0 to 100. Higher value indicates better performance.	Authors' calculations
Profitability	Commercial banks' after-tax net income to yearly averaged total assets (%).	GFDD
Solvency	Regulatory capital to risk weighted assets (%).	GFDD
Asset quality	Non-performing loans to gross loans (%). A reciprocal of the variable is used in the construction of the bank performance index.	GFDD
Liquidity	Liquid assets to deposits and short-term funding (%).	GFDD
Efficiency	Cost to income ratio calculated as operating expenses to the sum of net-interest revenue and other operating income (%). A reciprocal of the variable is used in the construction of the bank performance index.	GFDD
Financial inclusion		
Deposits to GDP	Outstanding deposits with commercial banks as a % of GDP.	FAS
Loans to GDP	Outstanding loans from commercial banks as a % of GDP.	FAS
Number of deposits	Number of deposit accounts with commercial banks per 1000 adults.	FAS
Number of borrowers	Number of borrowers from commercial banks per 1000 adults.	FAS
Control variables		
GDP growth	Annual percentage change of gross domestic product (%).	WDI
Inflation	Annual percentage change of consumer prices (%).	WDI
Lerner index	A measure of market power in the banking market that compares output pricing and marginal costs (%).	GFDD
Population density	Population divided by land area in square kilometres.	WDI
High income dummy	Dummy variable that is equal to 1 if the country is classified by the World Bank as high income or upper middle income and 0 otherwise.	Authors' calculations
Low income dummy	Dummy variable that is equal to 1 if the country is classified by the World Bank as low income or lower middle income and 0 otherwise.	Authors' calculations

Note: The table defines the variables used in the study and the source of the data. GFDD is the Global Financial Development Database, FAS is the Financial Access Survey, WDI is the World Development Indicators.

Appendix D: Correlation matrix for selected aggregated variables

Table D1: Correlation matrix

	Bank performance index	Deposits to GDP	Loans to GDP	Number of deposits	Number of borrowers	GDP growth	Inflation	Lerner index
Deposits to GDP	-0.038							
Loans to GDP	-0.031	0.658***						
Number of deposits	-0.014	0.615***	0.552***					
Number of borrowers	0.001	0.471***	0.583***	0.786***				
GDP growth	0.105***	-0.171***	-0.207***	-0.265***	-0.156***			
Inflation	0.021	-0.186***	-0.270***	-0.029	-0.035	-0.037		
Lerner index	0.165***	-0.014	-0.021	-0.074*	0.116***	0.228***	0.062**	
Population density	-0.048	0.267***	0.195***	0.287***	0.418***	0.080**	-0.005	0.174***

Note: The table presents the correlation between the bank performance index, inclusion variables, and control variables for the sample of 131 countries covering the period from 2005 to 2014. *, **, *** indicate significance at 10 percent, 5 percent, and 1 percent levels, respectively.

Tables

Table 1: Descriptive statistics for the full sample and by income region

Variable	Obs.	Mean	Std. Dev.	Min.	Max.	High income		Low income		Difference in means
						Obs.	Mean	Obs.	Mean	
Bank performance										
Bank performance index	1,124	54.598	31.733	0.000	100.000	787	54.960	373	53.752	1.208
Profitability	1,767	1.425	1.415	-9.770	7.880	1,062	1.204	705	1.758	-0.554***
Solvency	1,171	16.719	5.133	1.750	45.280	823	15.824	348	18.835	-3.011***
Asset quality	1,156	5.932	5.989	0.010	45.300	810	5.062	346	7.968	-2.906***
Liquidity	1,791	36.737	19.926	5.320	224.560	1,077	34.802	714	39.657	-4.853***
Efficiency	1,777	58.254	18.643	20.000	166.250	1,071	56.351	706	61.141	-4.790***
Financial inclusion										
Deposits to GDP	1,672	52.845	47.894	2.224	479.673	1,001	66.988	671	31.747	35.241***
Loans to GDP	1,702	45.491	37.818	0.736	318.596	1,023	60.001	679	23.629	36.372***
Number of deposits	997	1138.456	1171.312	1.633	7824.948	554	1633.172	443	519.781	1113.391***
Number of borrowers	795	183.489	213.249	0.054	1156.048	419	290.279	376	64.486	225.793***
Control variables										
GDP growth	1,796	4.050	5.343	-62.076	104.487	1,075	3.370	721	5.064	-1.694***
Inflation	1,695	20.989	593.433	-35.837	24411.000	1,011	4.576	684	45.249	-40.673
Lerner index	1,190	28.299	13.171	-17.335	93.866	768	28.313	422	28.273	0.040
Population density	1,837	321.165	1491.267	1.626	19073.100	1, 100	453.041	737	124.335	328.706***

Note: The table presents summary statistics for the full sample of 131 countries covering the period from 2005 to 2014. We categorise the variables in three groups: (i) the aggregate bank performance indicators; (ii) the aggregate financial inclusion indicators; and (iii) a set of country-level control variables. The table also presents the mean and number of observations statistics for the sub-samples of high income and low income countries. High income group is composed of high and upper middle income countries and low income group is composed of low and lower middle income countries as classified by the World Bank. The difference in means is calculated as the difference between high income countries and low income countries. *, **, *** indicate significance at 10 percent, 5 percent, and 1 percent levels, respectively.

Table 2: Financial inclusion and bank performance - Baseline results

	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)	Model (7)	Model (8)
L. Deposits to GDP	-0.1410	-0.1851						
	(-1.17)	(-0.97)						
L. Loans to GDP			-0.4682**	-0.4950**				
			(-3.01)	(-3.46)				
L. Number of deposits					-0.0056	0.0121		
					(-0.58)	(1.10)		
L. Number of borrowers							-0.0109	0.0145
							(-0.28)	(0.35)
GDP growth		0.9848**		0.8259**		1.0324**		1.2322**
		(2.52)		(2.12)		(2.10)		(2.41)
Inflation		0.1818		0.2390		0.7436		-0.6751**
		(0.45)		(0.58)		(1.37)		(-2.39)
Lerner index		1.7683**		1.7328**		1.5718**		1.5215**
		(7.32)		(7.55)		(6.05)		(5.26)
Population density		-0.0116		-0.0028		0.5342**		-0.0244
		(-0.59)		(-0.16)		(5.40)		(-1.64)
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Clustering	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	982	732	1,017	750	631	449	513	352
Adjusted R-squared	0.172	0.296	0.187	0.312	0.182	0.315	0.199	0.327

Note: The table reports the regression results of estimating the relation between financial inclusion and bank performance (Equation (1)). The dependent variable is the performance index. The main independent variables are lagged financial inclusion indicators: (i) deposits to GDP, (ii) loans to GDP, (iii) number of deposits, and (iv) number of borrowers. Control variables include a set of country-specific characteristics: (i) GDP growth, (ii) inflation, (iii) Lerner index, and (iv) population density. The regressions are run on the full sample of 131 countries covering the period of 2005-2014. Robust t-statistics are reported under the coefficients in parentheses. Standard errors are clustered at the country level. *, **,*** indicate significance at 10 percent, 5 percent, and 1 percent levels, respectively.

Table 3: Financial inclusion and bank performance - High versus low income countries

	Model (1)	Model (2)	Model (3)	Model (4)
L. Deposits to GDP * High income dummy	-0.2599			
	(-1.22)			
L. Deposits to GDP * Low income dummy	1.2156*			
	(1.88)			
L. Loans to GDP * High income dummy		-0.6012**		
		(-4.39)		
L. Loans to GDP * Low income dummy		0.2230		
		(0.62)		
L. Number of deposits * High income dummy			0.0072	
			(0.74)	
L. Number of deposits * Low income dummy			0.0330**	
			(2.07)	
L. Number of borrowers * High income dummy				-0.0247
				(-0.61)
L. Number of borrowers * Low income dummy				0.1294**
				(2.27)
GDP growth	0.8502**	0.7768**	0.9652**	1.2447**
	(2.20)	(2.05)	(2.02)	(2.37)
Inflation	0.1812	0.2296	0.9060*	-0.5708*
	(0.44)	(0.55)	(1.80)	(-1.86)
Lerner index	1.8157**	1.7790**	1.6244**	1.5344**
	(7.92)	(7.89)	(6.24)	(5.23)
Population density	-0.0091	0.0018	0.5152**	-0.0137
	(-0.50)	(0.11)	(5.36)	(-0.88)
Time fixed effects	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes
Clustering	Yes	Yes	Yes	Yes
Observations	732	750	449	352
Adjusted R-squared	0.307	0.318	0.318	0.339

Note: The table reports the regression results of estimating the relation between financial inclusion and bank performance for high income versus low income countries (Equation (2)). The dependent variable is the bank performance index. The main independent variables are the interaction terms between lagged financial inclusion indicators - (i) deposits to GDP, (ii) loans to GDP, (iii) number of deposits, and (iv) number of borrowers - and high and low income dummy variables. Control variables include a set of country-specific characteristics: (i) GDP growth, (ii) inflation, (iii) Lerner index, and (iv) population density. The regressions are run on the full sample of 131 countries covering the period of 2005-2014. Robust t-statistics are reported under the coefficients in parentheses. Standard errors are clustered at the country level. *, **,*** indicate significance at 10 percent, 5 percent, and 1 percent levels, respectively.

Table 4: Financial inclusion and bank performance - Income inequality

	Model (1)	Model (2)	Model (3)	Model (4)
L. Deposits to GDP	-0.4516			
	(-1.58)			
L. Deposits to GDP * Low inequality dummy	0.2658			
	(1.33)			
L. Loans to GDP		-1.0353**		
		(-3.19)		
L. Loans to GDP * Low inequality dummy		0.4190**		
		(4.46)		
L. Number of deposits			0.0078	
			(0.54)	
L. Number of deposits * Low inequality dummy			0.0075	
			(0.81)	
L. Number of borrowers				0.0975*
				(2.01)
L. Number of borrowers * Low inequality dummy				0.1252**
				(4.41)
GDP growth	1.2881**	0.9698*	1.0595	0.9568
	(2.23)	(1.71)	(1.58)	(1.03)
Inflation	0.0343	0.1700	1.0154	1.2882
	(0.14)	(0.66)	(1.12)	(1.24)
Lerner index	2.1654**	2.1611**	1.7883**	2.5072**
	(7.23)	(7.81)	(5.27)	(6.56)
Population density	0.0447	0.0762	0.5779	0.5638
	(0.04)	(0.07)	(0.45)	(0.63)
Low inequality dummy	20.8485**	15.5208**	11.9479**	18.6124**
	(-3.77)	(-3.68)	(-2.04)	(-2.80)
Time fixed effects	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes
Clustering	Yes	Yes	Yes	Yes
Observations	351	361	215	160
Adjusted R-squared	0.342	0.369	0.302	0.419

Note: The table reports the regression results of estimating the effect of income inequality on the relationship between financial inclusion and bank performance. The dependent variable is the bank performance index. The main independent variables are lagged financial inclusion indicators: (i) deposits to GDP, (ii) loans to GDP, (iii) number of deposits, and (iv) number of borrowers; and the interaction terms between these variables and the low income inequality dummy variable. Control variables include a set of country-specific characteristics: (i) GDP growth, (ii) inflation, (iii) Lerner index, and (iv) population density. The regressions are run on the full sample of 131 countries covering the period of 2005-2014. Robust t-statistics are reported under the coefficients in parentheses. Standard errors are clustered at the country level. *, **,*** indicate significance at 10 percent, 5 percent, and 1 percent levels, respectively.

Table 5: Financial inclusion and bank performance index - High versus low financial inclusion

	Full sample				High income sub-sample				Low income sub-sample			
	Model (1)	**Model (2)**	**Model (3)**	**Model (4)**	**Model (5)**	**Model (6)**	**Model (7)**	**Model (8)**	**Model (9)**	**Model (10)**	**Model (11)**	**Model (12)**
L. Deposits to GDP * High financial inclusion dummy	-0.1756				-0.2313				1.0049			
	(-0.93)				(-1.06)				(1.65)			
L. Deposits to GDP * Low financial inclusion dummy	-0.0607				-0.2863				1.3634*			
	(-0.25)				(-1.12)				(1.79)			
L. Loans to GDP * High financial inclusion dummy		-0.5132**				-0.5356**				0.2321		
		(-3.64)				(-3.72)				(0.63)		
L. Loans to GDP * Low financial inclusion dummy		-0.6232**				-0.6433**				1.3627*		
		(-3.28)				(-3.35)				(1.79)		
L. Number of deposits * High financial inclusion dummy			0.0121				0.0046				0.0421**	
			(1.10)				(0.45)				(2.97)	
L. Number of deposits * Low financial inclusion dummy			0.0101				-0.0046				0.0586**	
			(0.80)				(-0.36)				(2.30)	
L. Number of borrowers * High financial inclusion dummy				0.0029				-0.0246				0.1600**
				(0.07)				(-0.59)				(2.47)
L. Number of borrowers * Low financial inclusion dummy				-0.0416				-0.0982*				0.4142
				(-0.53)				(-1.82)				(1.48)
GDP growth	0.9957**	0.8542**	1.0340**	1.2737**	1.0260**	0.9169*	1.0678	1.0781	0.4879	0.6269	1.0500*	1.1638
	(2.53)	(2.21)	(2.10)	(2.44)	(2.18)	(1.96)	(1.43)	(1.63)	(0.81)	(1.02)	(1.88)	(1.11)
Inflation	0.1722	0.2329	0.7560	-0.6763**	0.6245	0.8012*	1.9991**	-0.5058	-0.4506	-0.5807	0.5744	-0.4907
	(0.43)	(0.56)	(1.38)	(-2.39)	(1.31)	(1.75)	(2.60)	(-0.56)	(-1.15)	(-1.52)	(0.91)	(-1.63)
Lerner index	1.7717**	1.7342**	1.5717**	1.5304**	1.9920**	1.9551**	1.7914**	1.7382**	1.4153**	1.4478**	1.3520**	1.3597**
	(7.34)	(7.65)	(6.05)	(5.33)	(6.68)	(6.94)	(6.05)	(4.73)	(3.63)	(3.13)	(2.56)	(2.48)
Population density	-0.0115	-0.0023	0.5373**	-0.0223	-0.0111	-0.0022	0.4954**	-0.0157	0.2977	0.2163	0.5842**	0.6526**
	(-0.58)	(-0.13)	(5.39)	(-1.51)	(-0.61)	(-0.13)	(4.14)	(-0.96)	(0.88)	(0.84)	(2.35)	(2.32)
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Clustering	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	732	750	449	352	534	544	285	226	198	206	164	126
Adjusted R-squared	0.296	0.312	0.313	0.326	0.350	0.371	0.353	0.404	0.212	0.236	0.258	0.272

Note: The table reports the regression results of estimating the relation between financial inclusion and bank performance for high versus low financial inclusion countries. The dependent variable is the bank performance index. The main independent variables are the interaction terms between lagged financial inclusion indicators - (i) deposits to GDP (models 1, 5, and 9), (ii) loans to GDP (models 2, 6, and 10), (iii) number of deposits (models 3, 7, and 11), and (iv) number of borrowers (models 4, 8, and 12) - and high and low financial inclusion dummy variables. Control variables include a set of country-specific characteristics: (i) GDP growth, (ii) inflation, (iii) Lerner index, and (iv) population density. Models (1)-(4) are run on the full sample of 131 countries using the full sample mean threshold, Models (5)-(8) are run on a sub-sample of high income countries, and Models (9)-(12) are run on a sub-sample of low income countries (using sub-samples thresholds). The sample covers the period of 2005-2014. Robust t-statistics are reported under the coefficients in parentheses. Standard errors are clustered at the country level. *, **,*** indicate significance at 10 percent, 5 percent, and 1 percent levels, respectively.

Table 6: Financial inclusion and bank performance – Stringency of capital regulation

	Model (1)	Model (2)	Model (3)	Model (4)
L. Deposits to GDP	-0.3331**			
	(-2.48)			
L. Deposits to GDP * High quality capital regulation dummy	0.2226**			
	(4.09)			
L. Loans to GDP		-0.5006**		
		(-3.96)		
L. Loans to GDP * High quality capital regulation dummy		0.1306**		
		(2.18)		
L. Number of deposits			0.0039	
			(0.32)	
L. Number of deposits * High quality capital regulation dummy			0.0076**	
			(3.01)	
L. Number of borrowers				-0.0001
				(-0.00)
L. Number of borrowers * High quality capital regulation dummy				0.0358**
				(2.48)
GDP growth	1.0720**	0.9831**	0.9731*	0.3992
	(2.66)	(2.45)	(1.82)	(0.73)
Inflation	0.5317	0.6439	1.1904*	-0.2254
	(1.23)	(1.50)	(1.96)	(-0.31)
Lerner index	1.8037**	1.7936**	1.6863**	1.5282**
	(6.45)	(6.77)	(5.80)	(4.17)
Population density	-0.0062	-0.0046	0.5498**	-0.0390**
	(-0.29)	(-0.24)	(4.83)	(-2.58)
Time fixed effects	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes
Clustering	Yes	Yes	Yes	Yes
Observations	623	637	368	286
Adjusted R-squared	0.344	0.346	0.336	0.343

The table reports the regression results of estimating the effect of capital regulation on the relation between financial inclusion and bank performance. The dependent variable is the bank performance index. The main independent variables are lagged financial inclusion indicators: (i) deposits to GDP, (ii) loans to GDP, (iii) number of deposits, and (iv) number of borrowers; and the interaction terms between these variables and the high stringency capital regulation dummy variable. Control variables include a set of country-specific characteristics: (i) GDP growth, (ii) inflation, (iii) Lerner index, and (iv) population density. The regressions are run on the full sample of 131 countries covering the period of 2005-2014. Robust t-statistics are reported under the coefficients in parentheses. Standard errors are clustered at the country level. *, **,*** indicate significance at 10 percent, 5 percent, and 1 percent levels, respectively.

Table 7: Financial inclusion and bank performance - Alternative measures of financial inclusion

	Model (1)	Model (2)	Model (3)	Model (4)
L. Bank branches per 1000 km²	-0.006			
	(-0.04)			
L. ATMs per 1000 km²		0.0082**		
		(5.91)		
L. Bank branches per 1000 km² * High income dummy			-0.0133	
			(-0.08)	
L. Bank branches per 1000 km² * Low income dummy			2.1025**	
			(2.39)	
L. ATMs per 1000 km² * High income dummy				0.0083**
				(6.00)
L. ATMs per 1000 km² * Low income dummy				0.6301
				(1.52)
GDP growth	0.9507**	1.0854**	0.9269**	1.0852**
	-2.46	-2.84	-2.42	-2.86
Inflation	0.1307	0.4681	0.1482	0.5299
	-0.32	-1.16	-0.36	-1.33
Lerner index	1.7584**	1.8085**	1.7969**	1.8557**
	-7.63	-7.56	-7.66	-7.72
Population density	-0.0157	-0.0341**	-0.0151	-0.0335**
	(-1.01)	(-2.93)	(-1.01)	(-2.99)
Time fixed effects	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes
Clustering	Yes	Yes	Yes	Yes
Observations	732	706	732	706
Adjusted R-squared	0.316	0.321	0.319	0.325

Note: The table reports the regression results of estimating the relation between financial inclusion and bank performance (Equation (1)) using the geographical outreach indicators of financial inclusion. The dependent variable is the performance index. The main independent variables are lagged financial inclusion indicators: (i) branches per 1000 km², and (ii) ATMS per 1000 km²; and the interaction terms between these indicators and high and low income dummy variables. Control variables include a set of country-specific characteristics: (i) GDP growth, (ii) inflation, (iii) Lerner index, and (iv) population density. The regressions are run on the full sample of 131 countries covering the period of 2005-2014. Robust t-statistics are reported under the coefficients in parentheses. Standard errors are clustered at the country level. *, **,*** indicate significance at 10 percent, 5 percent, and 1 percent levels, respectively.