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Does Foreign Bank Entry Contribute to Financial Depth?: Examining The Role of Income Thresholds

Sasidaran GOPALAN

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HKUST Institute for Emering Market Studies
The Hong Kong University of Science and Technology
Clear Water Bay, Kowloon, Hong Kong
T: +852 3469 2215 E: iems@ust.hk W: iems.ust.hk

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Author's contact information

Sasidaran Gopalan
Institute for Emerging Market Studies (IEMS) and Institute for Advanced Study (IAS)
The Hong Kong University of Science and Technology
E: gopalan@ust.hk

DOES FOREIGN BANK ENTRY CONTRIBUTE TO FINANCIAL DEPTH?: EXAMINING THE ROLE OF INCOME THRESHOLDS

SASIDARAN GOPALAN[1]

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ABSTRACT

This paper examines the relationship between foreign bank entry and financial depth for 57 emerging and developing economies (EMDEs) over 1995-2009. Using various measures of financial depth, the paper also explores the degree to which the relationship between foreign bank entry and financial sector deepening varies by different income thresholds of EMDEs. The empirical findings suggest that while foreign banks positively further financial depth, the marginal effects of foreign bank entry diminish over time with greater levels of economic development. That is, the impact of foreign bank entry tends to become smaller as the per-capita income of the country rises.

Keywords: *Foreign Bank Entry, Financial Depth, Financial Development, Income Thresholds*
JEL Classification: *F21, G00, G21, O16*

[1] Sasidaran Gopalan is Post-Doctoral Research Fellow at the Hong Kong University of Science and Technology (HKUST) Institute for Emerging Market Studies (IEMS) and Institute of Advanced Study (IAS), Hong Kong. Email: gopalan@ust.hk.
Mailing Address: HKUST IEMS, Lo Ka Chung Building, Lee Shau Kee Campus, The Hong Kong University of Science and Technology (HKUST), Clear Water Bay, Kowloon, Hong Kong

1. Introduction

The increasing foreign bank penetration in many emerging and developing economies (EMDEs) over the last two decades has given rise to a body of work dealing with its causes, consequences as well as debates. One such debate in the literature pertains to the contribution of foreign bank presence to overall financial sector development (Van Horen, 2013). Financial sector development is a rather broad term capturing "the factors, policies, and institutions that lead to effective financial intermediation and markets, and deep and broad access to capital and financial services" (World Economic Forum, 2011, p.xiii). The studies relating to foreign banks specifically focus on two aspects of financial development namely financial depth and financial inclusion. Though the literature has acknowledged the importance of financial inclusion,[2] largely due to data limitations, studies in this field have instead focused on financial depth when analyzing the impact of financial development. As the literature points out, foreign banks could contribute to financial sector deepening proxied by the expansion of banking credit to the private sector, or via enhanced liquidity in the domestic equity market, or contribute to a well-capitalized bond market. In this paper, we will focus on the financial depth dimension of financial development and whether foreign bank entry contributes to financial sector deepening in EMDEs.[3]

We contribute to the literature on foreign bank entry in three important ways: First, we explore the importance of income thresholds between EMDEs in determining the

[2] Financial inclusion broadly refers to the provision of financial services to as many households and firms as possible 'at affordable costs' in an economy.

[3] While we follow the literature in defining financial depth using banking credit to private sector, we also consider alternative measures like stock market capitalization and private bond market capitalization as indicators reflecting different dimensions of financial depth.

relationship between foreign bank entry and financial depth. In other words, does the impact of foreign bank entry on financial depth vary based on levels of economic development? While the limited literature on this subject points to the need to factor in such income differences while probing the relationship between foreign bank entry and financial depth, a systematic examination appears to be missing to date, a gap this paper attempts to fill. Second, unlike previous studies, we use various alternative measures of financial depth to examine the said relationship. Finally, we study the issue over a longer time horizon (1995-2009) for a fairly large sample of 57 EMDEs, whereas most studies done on the subject have been cross-sectional in nature.

To preview some significant results, the paper finds strong evidence in favor of foreign banks having a direct positive impact in furthering financial depth in EMDEs which is important from a policy perspective. Furthermore, one of the other interesting findings of the paper relates to the importance of factoring in income thresholds in understanding the relationship between foreign bank entry and financial depth. Specifically, we find that the marginal effects of foreign bank entry diminish as income levels of the country rises. In other words, the impact of foreign bank entry tends to become smaller, the richer the country becomes. That foreign bank entry enhances financial depth appears to be distinct departure from the general results found in the literature thus far. Further, the finding that the positive impact of foreign banks in enhancing financial depth tends to be greater in lower and middle income countries could guide policymakers in these economies to draft appropriate strategies promoting foreign bank entry.

The remainder of the paper proceeds as follows. Section 2 motivates the discussion by offering a brief overview of the determinants of financial development in general.

Section 3 surveys a selected set of empirical studies relevant to the discussion. The data and the empirical model employed in this paper are discussed in Section 4. Section 5 elaborates on the empirical findings and discusses the various robustness checks undertaken. Section 6 concludes the paper with a brief discussion of the policy implications of this empirical study.

2. Determinants of Financial Development

A large literature emphasizes that there is a strong and positive nexus between different dimensions of financial development and economic growth, particularly in EMDEs. Most studies relating to this field have primarily focused on understanding the factors that determine the differences in financial development across countries. For instance, La Porta et al. (1998) emphasized the importance of the differences in legal systems to explain the differences in financial development across countries.[4] Related to protection of legal rights and contract enforcement is good governance (Kaufmann et al. 1999) which has been noted as another pre-requisite for financial development. Focusing specifically on financial depth, in a survey of cross-country determinants of financial depth for 129 countries, Djankov et al. (2007) finds that a combination of macroeconomic and institutional variables such as GDP per capita, inflation, legal creditor rights, private and public credit registries turn out to be significantly associated with financial depth. They find that while both creditor protection through the legal system and information sharing institutions tend to be associated with higher financial depth, legal rights turn out to be

[4] The emphasis on legal traditions is largely driven by the observation that there are differences among countries in the degree to which they prioritize protecting the property rights of private investors. These differences in turn determine the efficiency of contract enforcements that are fundamental to financial sector development.

more important in richer countries relatively. They also reiterate the importance of GDP per capita and the role economic development plays in fostering higher financial depth.[5]

Though most of the literature has looked at institutional and macroeconomic variables as determinants of financial depth, a small but growing literature identifies openness to international financial flows as another important determinant of financial depth in EMDEs. One of the central conclusions from this literature is that higher international financial openness is positively associated with domestic financial sector depth, though it is conditional on countries achieving a certain threshold level of institutional development (for instance, see Baltagi et al., 2009; Calderon and Kubota, 2009; Chinn and Ito, 2006 and Kose et al., 2011). As Kose et al. (2011) suggest, financial sector development is one of the primary "collateral benefits" of international financial openness and that the development of domestic financial markets as well as enhanced corporate and public governance indirectly contribute to overall economic growth.

However, this literature fails to sufficiently distinguish between the two broad dimensions of international financial openness -- capital account openness and financial sector internationalization – and how they impact financial depth. Given that foreign bank entry has been a prominent feature of financial sector internationalization in many EMDEs over the last two decades, surprisingly, only a handful of studies examine the impact of foreign banks on financial depth and yield mixed results. While one set of studies find that foreign banks contribute to reduced costs of financial intermediation resulting in increased credit availability that in turn facilitates overall financial depth in the host country

[5] In addition to factors concerning the institutional environment, domestic political economy factors such as rent-seeking behavior of incumbents also determine the extent of financial development (Rajan and Zingales, 2003).

(Claessens et al., 2001; Martinez Peria and Mody, 2004), another set points out that this may not necessarily be the case in EMDEs. Instead, increased foreign bank presence could lead to lower levels of private sector credit that would in turn result in relatively weaker financial depth (Claessens and Van Horen, 2012; Detragiache et al., 2008). An important caveat to these results is that the negative association between foreign bank entry and financial depth may not hold for all countries and that the levels of economic development matter (Van Horen, 2013).

In this light, this paper is interested in examining the relationship between foreign bank presence and financial depth in EMDEs by focusing on some important inter-related issues that have not been examined in the literature thus far. Below we survey a selected set of empirical studies relevant to the discussion.

3. Selected Empirical Literature

There are two important sets of empirical literature relevant to the discussion. The first strand of literature concerns the impact of international financial openness on financial depth. The second set of studies pertains specifically to the impact of foreign banks on financial depth. We will provide a brief review of selected papers from each of these strands before outlining our empirical model.

3.1. International Financial Openness and Financial Development

A number of papers have tested for the relationship between international financial openness (broadly encompassing all types of capital flows) and financial development and have found that openness to international financial flows broadly serves as an important driver of domestic financial market development (Levine, 1996; Chinn and Ito, 2006;

Baltagi et al., 2009; and Calderon and Kubota, 2009). However, as Chinn and Ito (2006) emphasize, the link between financial liberalization and financial development is not "unequivocal" as financial liberalization can have the desired impact on financial development only when the host economies are equipped with some "reasonable" legal and institutional infrastructure. The rationale for the existence of such thresholds stems from the so-called 'absorptive capacity' of these economies to internalize the benefits of such financial flows. For instance, Johnston et al. (1997) suggests that before a country's capital account is opened, the financial intermediaries need to be strengthened in order to guarantee the efficient use of capital inflows. Countries with weak financial systems may need time to develop financial institutions and markets, especially the banking sector, before liberalizing their capital account. Thus the emphasis must be on establishing an effective system of prudential supervision before liberalizing the capital account (Eichengreen, 2001).

Thus the absence of legal protection for creditors and transparency in accounting rules could likely reduce the credibility of the domestic financial system, a point highlighted by the empirical study done by Chinn and Ito (2006). The study examines the relationship between capital account openness and financial development proxied by stock market capitalization as a proportion of GDP for a panel of 108 countries spanning 1980-2000. The authors find that a higher level of financial openness (measured by *de jure* capital account openness index of Chinn-Ito) spurs equity market development only if a threshold level of legal development has been attained. Furthermore, a country characterized by weak legal infrastructure with ill-defined property rights may lack the

capacity to strictly enforce contracts which could reduce the incentive for credit-related activities.

In a related paper, Baltagi et al. (2009) use panel data techniques to investigate whether the pace of financial development can be explained by the joint opening of both trade and financial sector openness. They use two datasets, one for 42 developing countries with banking credit to private sector as the dependent variable (1980-1996) and another for 32 industrial and developing countries with stock market capitalization as the proxy for financial development (1980-2003). They measure financial openness using both the *de jure* Chinn-Ito capital account openness index as well as the *de facto* ratio of foreign assets and liabilities to GDP sourced from Lane and Milesi-Ferreti (2007). The dynamic panel regressions the authors conduct suggest that trade and financial openness are statistically significant determinants of financial sector development.

In a similar study for an expanded sample, Calderon and Kubota (2009) test for the relationship between financial sector openness and domestic financial market development for a 145 economies from 1974-2007 and finds similar results. Specifically, they find that rising financial openness expands private credit, bank assets, and stock market and private bond market development and also generates overall efficiency gains in the domestic banking system. However, consistent with other studies, the paper finds that the positive impacts are conditional on the level of institutional quality, the extent of investor protection, and the degree of trade openness. The measure of financial openness used is the ratio of foreign assets to GDP, foreign liabilities to GDP, and foreign assets and liabilities to GDP sourced from Lane and Milesi-Ferreti (2007) database.

Finally, testing for threshold conditions in the process of international financial integration and how it affects economic growth, Kose et al. (2011) undertake standard cross-country growth regressions for 84 countries between 1975 and 2004. Their findings suggest that there are "clearly identifiable thresholds" in key variables such as financial depth and institutional quality and that the growth benefits from financial openness significantly improves once countries pass those identified thresholds.[6]

3.2. Foreign Bank Entry and Financial Depth

The relevant literature specifically investigating the relationship between foreign bank entry and financial sector depth is quite limited and ambiguous at best. While Detragiache et al. (2008) find a negative relationship between foreign bank entry and financial depth, Claessens and Van Horen (2012) finds that the negative result holds only for a sub-sample of developing countries and it disappears for emerging markets. On the other hand, Claessens et al., (2001) and Martinez Peria and Mody (2004) find that foreign bank entry leads to greater financial depth through lowering costs of financial intermediation. Further, as Cull and Martinez Peria (2011) argue, the possible negative relationship that other papers have found may not indicate any causal relationship between the two, instead this could have been driven by "non-random" entry of foreign banks into markets that were in crisis. Since most of the EMDEs started allowing foreign banks to recapitalize their banking systems, observing a drop in credit levels could have been the result of the efforts to repair the balance-sheets of struggling domestic banks.

[6] They also find that the thresholds are lower for foreign direct investment and portfolio equity liabilities compared to those for debt liabilities.

Studies in general have found evidence that foreign banks contribute to reduced costs of financial intermediation evident in lowering of bank spreads, spurring credit availability which in turn facilitates overall financial depth in the host country (Claessens et al., 2001 and Martinez Peria and Mody, 2004). However, increased foreign bank presence could also lead to higher interest rate spreads, lower levels of private sector credit that would in turn result in relatively weaker financial depth. Focusing on banking credit to private sector as a proxy for financial depth, Detragiache et al. (2008) use aggregate cross-country data for a sample of 89 lower-income countries to empirically test the association between foreign bank presence on growth in private credit levels. They test this using a standard cross-country regression framework as well as a dynamic panel framework, controlling for host country characteristics such as GDP per capita, inflation rates, credit depth of information index, time taken to enforce a business contract, as well as a corruption index. For the cross-sectional estimation they average the control variables over 1991-1998 and measure the dependent variable as a 3 year average over 1999-2002 while they use the data in its annual frequency for the dynamic panel estimation. Both their cross-section and panel estimation results suggest that the foreign bank participation is negatively associated with private sector credit.[7]

As an extension, the authors hypothesize that if greater foreign bank presence is negatively associated with private credit levels then they should observe a negative correlation between foreign presence and subsequent credit growth. Hence they examine the relationship between foreign bank presence and credit growth (as opposed to levels),

[7] They also run bank-level panel regressions to test whether foreign banks have a better quality of loan portfolios (proxied by ratio of loan-loss provisions to total assets) than domestic banks within any country and find the results to be consistent with the hypothesis that foreign banks have a higher quality loan portfolio than domestic banks within any given country.

and for the purposes of this estimation, compute the dependent variable as the log difference of the private credit-to-GDP ratio in 1999 to 2001 and in 1994 to 1996. Their baseline specification similar to what was conducted in the first part of the analysis revealed consistent results in that they found foreign bank presence to have a negative and significant effect on credit growth.

Claessens and Van Horen (2012) perform a similar exercise for a sample of 111 countries representing all levels of development. In essence, they replicate the work of Detragiache et al. (2008), for a larger sample of countries as well as use an updated database on foreign bank ownership which the authors themselves have compiled. They also test specifically for the relationship between foreign bank presence and private credit levels conditional on host-country institutional characteristics similar to Detragiache et al. (2008). They average the dependent variable - private credit to GDP ratio - over 2005-2007 along with a similar set of control variables as used by Detragiache et al. (2008), to include GDP per capita, inflation, the availability of information to creditors and the time it takes to enforce contracts.

They find that their results are broadly in line with those of Detragiache et al. (2008) but with one important qualification. Their negative relationship between private credit levels and foreign bank presence holds only in countries characterized by limited foreign bank presence coupled with costly access to information and contract enforcement. They also find that the negative relationship holds only when the distance between the home country of the foreign bank and the host country is relatively "far." Interestingly, as Claessens and Van Horen (2012) observe, the negative relationship between foreign bank presence and private credit is only apparent for the sub-sample of developing countries

though not very obvious for emerging markets. This heterogeneity in the results appears to underline, among other things, the importance of factoring in host country institutional characteristics and levels of development.

While some of the papers discussed above suggest a negative relationship between foreign bank entry and financial depth, they do not necessarily imply a causal relationship. Further, while they hint that the results must be qualified by accounting for heterogeneous levels of economic development and/or foreign bank entry, the papers do not explore the issue further, a gap that we attempt to fill in this paper by explicitly accounting for differences in income levels.

As briefly noted earlier, we improve the literature in three important ways: One, we examine the relationship between foreign bank entry and financial depth over a longer time horizon 1995-2009 while most studies hitherto have either employed shorter panels or cross-sectional data; Second, we test our conjectures in a panel spanning 57 emerging and developing economies across different income levels which we believe is important to distinguish in order to understand the role foreign banks play in contributing to financial sector deepening; Finally, we consider other alternative measures of financial depth such as stock and bond market capitalization in addition to banking credit to private sector which has remained the most widely used proxy for financial depth in the literature so far.

4. Data and Empirical Model

4.1. Baseline Model

The empirics are performed on a panel dataset of 57 emerging and developing economies (EMDEs), spanning all regions of the world, covering the period from 1995 to 2009 (depending on data availability for each economy) (Annex 1.1). As noted by Claessens and Van Horen (2011), the emerging group of countries include those that are in the Standard and Poor's Emerging Market and Frontier Markets indices and that were not high-income countries in the year 2000.[8] The developing countries sample includes all other countries based on World Bank's income classification (as of year 2000).

We proceed with our analysis in two steps. First, we specify a baseline panel regression following Detragiache et al. (2008) that helps us investigate the relationship between financial depth – as proxied by banking credit to private sector -- and the share of foreign bank assets over total banking assets in that country, controlling for levels of economic development, other relevant macroeconomic, financial and institutional factors dictated by data availability. Second, we examine how the impact of foreign bank entry on financial depth is affected by possible non-linearities in the relationship between financial depth and income per capita per se.

The basic estimating equation will be as follows:

$$y_{it} = \delta_i + \beta fb_{it} + \boldsymbol{\gamma X}_{it} + \mu_t + u_{it} \qquad (1)$$

[8] The criteria for Standard and Poor's to classify a stock market as "emerging" includes one of the following several general criteria (Standard and Poor's, 2007): "(i) it is located in a low or middle-income economy as defined by The World Bank, (ii) it does not exhibit financial depth; the ratio of the country's market capitalization to its GDP is low, (iii) there exist broad based discriminatory controls for non-domiciled investors, or (iv) it is characterized by a lack of transparency, depth, market regulation, and operational efficiency" (p.4). This classification of "emerging market economies" was adopted by Claessens and Van Horen (2011) in the construction of their database on foreign bank entry which we utilize through this dissertation. For more details, see Claessens and Van Horen (2011); for a detailed methodological note on the S&P Emerging and Frontier Market Index, see Standard and Poor's (2007).

where: y_{it} is the banking credit to private sector by deposit money banks (as a share of GDP) in country *i* at time *t;*

fb_{it} is the share of bank assets held by foreign banks in country *i* at time *t;*

δ_i is the country fixed effect.

$\boldsymbol{X}_{it}$ is a matrix of control variables measured at time *t*;

μ_t is the time fixed effect and

u_{it} is the idiosyncratic error term.

β and γ are the parameters to be estimated. The parameter of interest is β which represents the coefficient of the foreign bank share (fb_{it}). Based on the literature discussed in the foregoing section, a selected set of macroeconomic, financial and institutional variables affecting private credit creation in an economy are employed as controls in our model. The vector of control variables are listed below:

$\boldsymbol{X}_{it} = Macro\ variables\ \{GDP\ Per\ Capita, Inflation, Exchange\ Rate\ Regime, Public\ Debt\};$

$= Financial\ variables\ \{Bank\ ZScore\};$

$= Institutional\ variables\ \{Creditor\ Information, Legal\ Rights, Corruption\}$

All the sources from where the variables were compiled are summarized in Annex 2.1 Below we offer a brief description of the variables employed in our model along with the priors.

GDP Per Capita: measuring overall levels of economic development in the country. We expect a positive relationship between financial depth and countries with higher levels of development.

Inflation rate: as measured by the Consumer Price Index (CPI) for each country and we expect inflation to have an adverse impact on financial depth as an increase in the rate of

inflation tends to decrease the real rates of return for assets in general. This in turn aggravates credit market frictions and leads to credit rationing. As Boyd et al. (2000) find, during periods of higher inflation, "intermediaries lend less and allocate capital less effectively, and equity markets will be smaller and less liquid" (p.2).

Exchange Rate Regime: exchange rate regime of country *i* at year *t*; We expect greater flexibility in exchange rates to be positively associated with financial depth as it provides incentives for the development of financial market instruments that in turn enables countries to hedge against risks, thus furthering financial depth.

Public Debt: reflecting the gross public debt as a percentage of that country's GDP. We expect greater public indebtedness to lower financial depth, as greater pressures on authorities to persist with or introduce financial repression will likely hinder financial depth.

Bank Z-Score: capturing the probability of default of a country's banking system, calculated as a weighted average of the z-scores of a country's individual banks (based on the individual banks' total assets). The Z-score compares a bank's buffers (capitalization and returns) with the volatility of those returns. We would expect a negative relationship between a higher Z-score and financial depth as a higher probability of default of a country's banking system could likely lead to greater risk aversion that might hinder financial depth.

Credit Depth of Information Index: captures the cost to banks of obtaining information about borrowers and we expect that higher information availability to be positively associated with financial depth in the economy, as it helps ease out information

asymmetry. So, higher values in the index should lead to a positive association with financial sector deepening due to better information environment.

Legal Rights Index: measuring the strength of legal rights in an economy that protect the rights of borrowers and lenders. We expect countries with stronger legal protection of creditors to have deeper credit markets and thus carry a positive sign.

Corruption Index: a measure capturing the perceptions of the extent to which public power is used for private benefits. The index ranges from -2.5 to +2.5, with greater values of the index reflecting better governance outcomes. In other words, a decrease in the index would reveal greater "State capture" by a few interests leading to 'politically connected' lending that may not contribute to financial sector deepening. Hence we expect countries with higher scores on this index to be positively associated with financial depth. That said, the direction of the relationship could go the other way as well if corruption might result in greater connected lending to specific parties, which would be reflected in greater credit creation– one of the indicators of financial depth.

4.2. Income Thresholds

Among all these variables listed above, most studies find per capita income to be an important determinant of financial depth. However, the literature assumes a linear relationship between per capita income and financial depth, which may not be necessarily true. A simple graphical illustration shown in Figure 1 reveals that the relationship between financial depth -- proxied by banking credit to private sector as a percentage of GDP – and income per capita does not appear to be quite linear. In fact, a quadratic fit can be seen from Figure 1 specifically which maps private sector credit and GDP per capita.

Figure 2 provides additional evidence by mapping the augmented component-plus-residual (ACPR) plot, conventionally used in the literature to examine the non-linear relationship between variables of interest. We use locally weighted scatterplot smoothing (LOWESS) to draw the observed pattern in the data to help identify possible nonlinearities.

[Insert Figures 1 and 2 here]

The above illustrations provide indicative evidence of a certain degree of non-linearity governing the relationship between GDP per capita and financial depth. Motivated by this basic relationship, we conjecture that there are income thresholds that affect levels of financial depth in a country. While, in general, the richer the country the greater might be the financial depth it is also likely that beyond a particular threshold, this relationship may turn negative.[9] Thus, in order to understand the relationship between foreign bank entry and financial depth, we must also capture the effect of threshold levels of income per capita, a point that has not been sufficiently appreciated by the available literature.

To capture the potential importance of different income thresholds and how it affects the way foreign banks impact financial depth, we re-run our baseline by introducing a quadratic GDP Per Capita term as shown in equation (2) below:

$$y_{it} = \delta_i + \beta_1 GDPPC_{it} + \beta_2 GDPPC_{it}{}^2 + \beta_3 fb_{it} + \boldsymbol{\gamma X}_{it} + \mu_t + u_{it} \quad (2)$$

By allowing interactions between foreign bank entry and the different income thresholds, we allow for the possibility that, beyond a certain level, the threshold variable

[9] This is not unlike the literature on public debt and economic growth where economic growth appears to be positively impacted by public debt up to a certain threshold beyond which growth turns negative. See Ouyang and Rajan (2014) for a recent application of debt thresholds in debt-growth relationship.

becomes more or less important in determining the marginal effect of foreign bank entry on financial depth.

4.3. Methodology

It should be noted that the market share of foreign banks may be endogenous, as foreign banks could a priori choose to enter only those countries with a certain threshold of financial depth. A priori, as Detragiache et al. (2008) point out, it is not clear how endogeneity might bias the coefficient β that represents foreign bank share. However using fixed-effects estimation, we can control for unobserved country-specific fixed characteristics that might affect financial depth. A further point to note is that the estimates of the fixed-effects estimation remain robust only if the potential source of endogeneity arises from the correlation between the time-invariant component of the error term and the regressor of interest, as a fixed-effects model resolves this problem by excluding the unobservable time-invariant effects through a time-demeaning of the data. Hence we estimate (1) and (2) using a fixed-effects panel data model, incorporating both country and time fixed-effects.

5. Empirical Results

5.1. Baseline Model

We start with our baseline model as outlined in equation (1) that estimates the relationship between foreign bank entry and financial depth controlling for macroeconomic, institutional and financial variables. The results of our panel estimation using country and time fixed effects with robust standard errors are summarized in Table 1. Column (1) in Table 1 reports estimates of our baseline without foreign bank entry.

Column (2) reports the estimation results of our baseline model with the foreign bank variable.

As Column (1) shows, GDP per capita and creditor information turn out to be highly statistically significant determinants of financial depth. The significance of GDP per capita is suggestive of the importance of accounting for heterogeneous levels of economic development while creditor information underlines the importance of a better information environment for enhancing financial depth. Bank Z-score and lack of corruption on the other hand appear to be significant at the 5 percent level, with the statistical significance of z-score indicates that an increase in the probability of banking default is negatively associated with financial depth and lack of corruption reflecting better governance also contributing positively to financial depth. Thus the direction of the relationship for all the significant variables conforms to our priors.

[Insert Table 1 about here]

In Column (2) we provide the estimates of our baseline specification including the foreign bank variable. As we can see, the model proves to be slightly better with more variables including foreign bank assets becoming statistically significant. GDP per capita and creditor information continue to be highly significant at the 1 percent level reiterating their positive association with greater financial depth in an economy. In addition to the statistical significance of z-score and lack of corruption, we find inflation to be statistically significant as well at the 5 percent level. The direction of relationships of all the significant variables continues to be consistent with our priors. In particular, our key variable of interest -- foreign bank entry -- is significant at the 5 percent level and shows up with a positive coefficient – which is a departure from the earlier literature that found a negative

relationship. Specifically a 10 percentage point increase in share of foreign bank assets is associated with approximately a 0.9 percentage point increase in financial depth.

5.2. Foreign Bank Entry and Financial Depth: Do Income Thresholds Matter?

As noted in Section 4.2, the relationship between GDP per capita and financial depth does not appear to be linear. In order to ensure that the effects of this non-linearity are accounted for fully in examining the relationship between foreign bank entry and financial depth, we empirically test for income thresholds by augmenting a quadratic term of GDP per capita to our baseline model. The results of the estimation of equation (2) are produced in Table 2.

As Table 2 reveals, there are three relevant issues that need to be scrutinized in the model in order to test the significance of income thresholds. The first step is to check the behavior and consistency of all the variables in the baseline model when we control for quadratic effects of per capita income, which is captured by Column (1) in Table 2. The next issue of interest to us is to examine the indirect impact of foreign bank entry on financial depth through its interaction with different thresholds of per capita income. While Column (2) captures the marginal effects of foreign bank entry through its interaction with the linear per capita income term, Column (3) shows the estimation results incorporating the interaction of foreign bank entry with higher thresholds of per capita income captured by the quadratic GDP per capita term.

[Insert Table 2 about here]

As summarized in Table 2, we find that the model produces consistent and highly statistically significant results, which appear to be strongly in favor of factoring in levels of economic development. Note that the GDP per capita coefficients – both linear and

quadratic – are consistently positive and negative, respectively. These results appear to be consistent with our conjectures on income thresholds suggesting that a country experiences greater financial depth as it grows richer but the positive relationship holds only up to a certain threshold. Beyond that threshold, the impact of GDP per capita will be negatively associated with financial depth.

However, it must be recognized that while the statistical significance of the non-linear income per capita coefficients and their interactions with foreign bank entry appear to support our conjectures, the economic significance of these variables appear to be small, suggesting that the actual measurable impact in terms of the magnitude of the coefficients is fairly modest.[10] That being said, the exclusion of the quadratic term might lead to misspecification errors because we observe an apparent quadratic relationship between GDP per capita and financial depth as illustrated in Figures 1 and 2. Further, we can also note that the economic significance of the linear GDP per capita term is higher when the non-linearity is controlled for. An increase in GDP per capita by 1000 US$ is associated with a 10 percentage point increase in financial depth as opposed to a 3 percentage point increase in the baseline sample without the non-linear term.

In similar vein, we can also observe that the marginal impact of foreign bank entry on financial depth appears to be weakening as countries move up the income ladder. In other words, while the direct effect of foreign bank entry on financial depth appears to be positive and statistically significant at the 5 percent level, higher levels of per capita income

[10] It must be noted that a logarithmic transformation of the GDP per capita variable or any kind of centering of the variable does not produce consistent results in terms of economic or statistical significance. Further, it also merits attention that a panel stationarity test strongly rejected the hypothesis that the series GDP per capita contained unit roots. The results of a Fisher-type unit root test, using the Augmented Dickey Fuller (ADF) test option for panel is reported in the Annex. We specify a drift option as mean GDP per capita for any country is nonzero and use two lags in the ADF regressions. We also remove cross-sectional means. All the tests strongly reject the null hypothesis that all the panels contain unit roots.

weaken the indirect marginal effects of foreign banks on financial depth. A 10 percentage point increase in share of foreign bank assets is associated with approximately 1.2 percentage point increase in financial depth while higher levels of income per capita tends to weaken the direct impact.

One way of interpreting the above results would be that they offer evidence in favor of our conjecture that income thresholds matter in the way foreign banks affects financial depth. Further, the fundamental results between the variables of interest remain consistent with the inclusion of other conditioning variables pertaining to macroeconomic, institutional and financial structure in these countries. As Columns (1) – (3) indicate, in addition to GDP per capita and foreign bank entry, we find that creditor information, corruption, z-score and inflation to be statistically significant, consistent with our priors.

5.3. Robustness Checks

The results of our baseline estimation summarized in Tables 1 and 2 provide indicative evidence that foreign banks affect financial depth positively and also plausibly vary based on the income thresholds. However the question still remains as to whether there are specifically identifiable income thresholds across which these results will remain robust. To that end, the focus of this section will be to empirically test for such income threshold effects.

In an effort to identify the significance of different income thresholds, in this section we slice our data sample on the basis of different income thresholds and re-estimate our baseline equation. In addition to slicing the sample on the basis of various income based and regional thresholds, we also undertake two other types of robustness checks to verify the consistency of the results we have found so far. The first category of robustness checks

involves alternative estimation techniques using dynamic panel estimation as well as instrumental variable methods. The second category of robustness tests involve using alternative measures of financial depth to check if our findings continue to hold. We provide a discussion of the results of the various robustness checks below.

5.3.1. Income Based Slicing

Considering that the impact of foreign bank entry on financial depth could vary across countries with different income levels, we first begin by re-running our baseline model for subsamples classified on the basis of different income levels. Table 3 reports the baseline estimates for the sub-samples that follow different income-based classifications. Specifically, while Columns (1) and (2) splits the sample into developing and emerging economies, Columns (3) through (5) adopt a finer classification and categorize the 57 EMDEs in our sample into high-income, middle-income and low-income economies, based on World Bank's classification.[11]

Interestingly, the results are broadly consistent with our full sample results. Notably, the foreign bank variable appears to be statistically significant and positive in the developing economies subsample as well as middle and low income sample. Institutional variables such as creditor information and corruption continue to be statistically significant as well, similar to what we found in the baseline model. However, GDP per capita appears to be a bit inconsistent across the various specifications in terms of its statistical significance, suggesting perhaps the need to examine the relationship between per capita income and financial depth more carefully and account for non-linearities if any.

[11] The average income of the countries in our developing economies sample is around US$1930, while that of emerging market economies is about US$ 4765.

Nevertheless, it is important to note that the direction of all variables of interest is consistent with our priors. In particular, the foreign bank variable continues to be positively associated with financial depth, underlining its robustness across different specifications.

[Insert Table 3 about here]

The next step is to estimate equation (2) for our income based sub-samples in order to account for possible non-linearities in the relationship between per capita income and financial depth. We split the sample again into two groups -- emerging and developing. As noted earlier, recall that the emerging group of countries is based on the Standard and Poor's Emerging Market and Frontier Markets index and that were not high-income countries in the year 2000. The developing countries sample includes all other countries based on World Bank's income classification (as of year 2000). Also, it is useful to recall that the average income of the countries in our developing economies sample is around US$1930, while that of emerging market economies is about US$ 4765.

Table 4 summarizes the results for both the emerging and developing country subsample. Our estimation proceeds in similar steps to what we did in the full sample. Columns (1) to (3) provide the estimation results for the developing economies subsample. The estimating equation (2) has been augmented with linear and quadratic interaction terms between foreign bank entry and GDP per capita. The same set of results for the emerging economies subsample is reported in Columns (4) through (6).

The broad conclusion that we can draw from scanning the results is that our full sample results are robust and we find evidence of an income threshold effect when estimating equation (2) using broad income-based subsamples.

Examining the results closely, as we can observe from Table 4, for the developing country sub-sample, the model produces insignificant GDP per capita terms (both linear and quadratic) in the first two columns though the quadratic GDP per capita becomes marginally significant when controlled for interaction with foreign bank entry. While the model does not work very well at least with regard to the significance of the GDP per capita variable, interestingly we find that the foreign bank variable registers an improvement in terms of its statistical significance as we control for non-linearities in per capita income. As Column (3) shows, foreign bank presence remains significant at the 5 percent level and is positively associated with financial depth while its interaction with the quadratic GDP per capita terms seems to be extremely significant and negative. One plausible way to interpret this result is that the impact of foreign bank entry on financial depth is stronger and positive at lower thresholds of economic development and tends to turn negligible or even negative at higher levels of economic development beyond a particular point.

[Insert Table 4 about here]

In contrast, as Columns (4) to (6) show, the results for the emerging market subsample are more consistent with the findings of the full-sample. We find the direction and statistical significance of the relevant coefficients to be identical to that of what we found in the full sample. Foreign banks are consistent in having a positive association with financial depth and this effect is stronger when controlled for income threshold effects. However, the interaction term with quadratic income per capita while carrying the right sign, is not statistically significant.[12]

[12] As an extension, we also used the finer income classification reported by the World Bank by splitting the developing and emerging economies into High Income, Low Income and Middle Income categories and tested for the significance of quadratic per capita income. The results (not shown) appear to suggest that the foreign

5.3.2. Region Based Slicing

While the income based splitting appeared to indicate that a sample splitting is appropriate, we try to slice the sample on the basis of different regions, as classified by the World Bank. It is useful to note at the outset that we have an asymmetry in terms of representation of countries from different regions, with more countries coming from the Europe and Central Asia (ECA) and the Latin America and Caribbean (LAC) regions relative to Asia or Sub-Saharan Africa or Middle East and North Africa. Further, most of the institutional variables drop out of the estimation because of a large number of missing observations.

Keeping these in mind, we estimate a baseline with just the macroeconomic variables to get a sense of whether the expected relationships hold in terms of income thresholds. As the results in Table 5 show, the basic relationship of interest involving foreign bank assets and the quadratic term of GDP per capita follows the priors in ECA and LAC region subsamples, where we have lesser missing data concerns relative to the rest of the regions.

[Insert Table 5 about here]

5.3.3. Other Estimation Procedures

Applying fixed effects estimation to dynamic panels could potentially lead to significantly biased OLS coefficients and that the size of the bias is larger the shorter the time dimension of the panel. Given the potential endogeneity bias among the independent variables, there could be further estimation problems. To overcome these econometric

bank variable is positive and statistically significant along with the quadratic per capita term which is also significant across different income categories, thus conforming to our conjectures. However the interaction terms were not significant. The results are available on request.

issues, we re-estimate our baseline model using the system GMM estimator developed by Arellano and Bover (1995), which uses lagged levels of the series as instruments for the endogenous variables in the equations in first differences and lagged differences of the dependent variable as instruments for equations in levels. As noted by Detragiache et al., (2008, p.2142), the rationale for doing so would be that lagged foreign bank market share would affect present levels of financial depth only through the current foreign bank market share.

We employ a two-step system GMM with finite sample correction to the covariance matrix (Windmeijer (2005)), specifying up to two lags for instruments. A test of serial correlations for the error terms of the differenced equation is also used to check the validity of the instruments. Table 6 provides the results of the dynamic panel estimation, using Arellano-Bond estimation.

[Insert Table 6 about here]

We can see that our lagged dependent variable turns out to be extremely significant and the coefficient is closer to 1 which provides evidence of serial correlation and hence justifies the use of dynamic system GMM. Most variables remain consistent after instrumentation and foreign bank variable continues to be positively and significantly associated with financial depth. The output also presents no significant evidence of serial correlation in the first-differenced errors at orders 1 and 2.

Further, following the convention in the literature, we also re-run the baseline dynamic specific using an instrumental variables estimation procedure to address potential endogeneity issues as well as check for consistency of our baseline fixed effects estimation. Choosing instruments tend to be tricky and there is no convincing evidence in favor of any

particular instrument. However, the ideal instrument should explain foreign bank presence but have no other direct effects on financial depth after controlling for other standard determinants.

We use two forms of instruments and the first set follows the standard practice in literature (See for instance Calderon and Kubota, 2009) in using the lagged version of all the control variables including that of foreign bank entry. The second follows Detragiache et al. (2007), and we instrument foreign bank entry with a measure of potential market size captured by population density. As explained by Detragiache et al. (2007), foreign banks operating in multiple markets have the advantage of diversifying country-specific risk than domestic banks. In countries where markets are small, foreign banks would be in a position to capture a significant market position with relatively smaller scale of investments. These reasons make the size of a market captured by population density a potential instrument. Further, the validity of the instrument cannot be challenged only if population does not affect financial depth through other channels. Table 7 reports the second-stage results of the instrumental variable estimation, done using two-stage least squares (TSLS). The key variables of interest continue to conform to our priors and also remain statistically significant.

[Insert Table 7 about here]

Thus the various alternative estimation techniques appear to deliver consistent results in terms of significance and the direction of coefficients of interests relative to our baseline fixed effects estimation, serving as useful robustness checks.

5.4. Alternative Measures of Financial Depth

The final set of robustness checks we undertake is to try alternative measures of financial depth. Based on the discussion in Section 2.3 of this paper, we know that the literature indicates that financial depth is not just about banking sector depth through credit creation but also involves the depth of stock and bond markets. To that end, stock market capitalization (as a percentage of GDP) and private bond market capitalization (as a percentage of GDP) are two accepted measures in the literature capturing different dimensions of financial depth. We illustrate the results of using these variables as the dependent variables, and re-running our baseline estimation.

Before we examine the results, it is worth highlighting some data limitations. While the data we have for stock market capitalization spans 44 countries, there are still lots of missing observations for several years which reduces the total number of observations to 342 -- substantially smaller than the data on private credit creation in the full sample. The data for private bond market capitalization is even more limited, with the total number of observations significantly dropping by more than a half, with the final count of countries in our sample being 14 corresponding to 126 observations.

[Insert Table 8 about here]

Column (1) in Table 8 summarizes the results of the empirical model for the full sample using stock market capitalization as the dependent variable. The results indicate that the per capita income – both in its linear and quadratic forms turn out to be statistically significant in explaining financial depth. In addition, we also find that foreign bank entry is not only positively and significantly associated with fostering financial depth, but the marginal effects on financial depth decrease with greater incomes. This is robust

and consistent with earlier findings and our priors that the marginal effects of foreign banks on financial depth diminish as per capita incomes increase over time. It is also evident from the regression results that two other institutional variables that are statistically significant are legal rights and corruption, with the former being highly significant at the 1 percent level and the latter at the margins (10 percent level). Countries with stronger legal protection of creditors are expected to have deeper credit markets and thus are positively associated with fostering financial depth, a result that is also consistent with the findings from the literature.

Column (2) in Table 8 reports the results of the empirical model for the full sample using private bond market capitalization as the dependent variable. The results conform to the larger income threshold story as per capita income – both in its linear and quadratic forms turn out to be statistically significant though only at the margins. They are consistent with our priors, carrying the expected signs. Interestingly the model shows foreign bank entry is not only positively and significantly associated with enhancing financial depth, but the marginal effects on financial depth decrease with greater incomes.

6. Conclusion and Policy Implications

Rising foreign bank participation in many emerging and developing economies (EMDEs) has given rise to a large body of work exploring its multi-faceted impacts. One of the unsettled debates in the literature on foreign bank entry pertains to the contribution of foreign bank presence to financial sector depth in the host economy. Foreign banks are expected to positively enhance financial sector depth through their impact on credit creation and lowered cost of financial intermediation. They are also expected to contribute

to greater equity and bond market liquidity thus enhancing financial depth in an economy. However there is a small but growing literature that appears to suggest that foreign bank entry results in raising interest rate spreads, lowering credit creation and negatively affecting financial depth. In this context, this paper has examined the relationship between foreign bank presence and financial depth in 57 EMDEs. Specifically, we have investigated the significance of foreign banks in contributing to alternative measures of financial depth in a panel of 57 EMDEs between 1995 and 2009 and also empirically tested if this relationship is affected by different income thresholds of countries.

The findings of the study appear to run counter to the existing literature in this field where our fixed-effects panel data estimation suggests that foreign bank entry is significantly and positively associated with financial depth and is robust across different subsamples based on income classification. However, the variations in the significance of foreign bank entry in fostering financial depth across different income groups confirms the importance of accounting for the heterogeneous levels of economic development across countries, a finding that is also consistent with the previous literature.

In order to explore further the non-linear relationship between per capita income and different measures of financial depth, this paper tested the significance of income thresholds for countries in determining the relationship between foreign bank entry and financial depth. The empirical analysis strongly suggests the existence of income threshold effects. The results show that while foreign banks have a direct positive impact in furthering financial depth, the marginal effects of foreign bank entry diminishes as income levels rise. In other words, the impact of foreign bank entry tends to become smaller the richer the country becomes over time.

Probing this point further, we slice our data sample into different subsamples based on per capita income thresholds in order to ascertain the significance of income thresholds on how foreign banks affect financial depth and find that the results are robust and consistent. We also run a variety of other robustness tests, using different estimation procedures and alternative indicators of financial depth as well as slicing the sample on the basis of regions. Across the board, the results remain largely consistent and reiterate the importance of explicitly factoring in the heterogeneous levels of economic development when examining the relationship between foreign bank entry and financial depth.

The empirical findings of the paper have some important policy implications as well. There is a widespread recognition in the finance-growth literature that both bank-based and financial-markets based intermediation are positively linked to output growth. The deepening of bank-based financial sector in particular has been found to be particularly valuable for countries at their earlier stages of development (Gambacorta et al. 2014). The significant and positive association that our empirical results show between foreign bank entry and financial depth – especially for low and middle income countries -- provides a strong case for policy makers in these economies to design policies to promote foreign bank entry. Such policies, if implemented in a calibrated manner, will likely help them achieve higher financial development, thereby leading to positive growth outcomes. However, the paper's findings also underline the importance of factoring in the levels of economic development of countries in understanding the relationship between foreign bank entry and financial depth. The results find an inverse U-shape relationship in the way foreign banks affect financial depth, i.e. the marginal effects of foreign bank entry tend to

reduce as countries grow richer, implying that a one-size-fits-all approach to financial liberalization is likely to be counter-productive.

The empirical results also reiterate the importance of sound institutions that would provide an enabling environment for foreign banks to enhance financial depth. In particular, the depth of information about creditors emerges as a highly significant variable consistently across different specifications. This is in line with the findings of the broader literature on international financial openness and financial development which emphasized the need for host economies to be equipped with sound institutional infrastructure in order to benefit from international financial openness (Chinn and Ito, 2006). To a large extent, the freedom from corruption variable also appears significant in most specifications, which speaks to the positive impact of better governance in enhancing financial depth in an economy.

Finally, the findings of the paper also underline the importance of banking and prudential regulation for EMDEs. The significance of Bank Z-score – which captures the probability of default of a banking system in a country -- as a key determinant of financial depth in our model reiterates the need to establish an effective system of prudential regulations. For instance, Mishkin (2001) argues that in order for financial liberalization to work and to reduce the likelihood of financial crises, institutional and governance prerequisites such as adequate prudential supervision as well as accounting and disclosure standards must be in place. Our results appear to be consistent with such observations from the literature.

References

Arellano, M. and O. Bover, 1995. Another look at the instrumental variable estimation of error-components models, *Journal of Econometrics,* 68, 29–52.

Baltagi, B., P. Demetriades, and S.H.Law. 2009. Financial development, Openness and Institutions: Evidence from panel data. *Journal of Development Economics*, 89, 285-296.

Boyd, J. R. Levine and B. Smith. 2000. The impact of inflation on financial sector performance, *Journal of Monetary Economics,* 47, 221–248.

Calderon, C. and M. Kubota. 2009. Does Financial Openness Lead to Deeper Domestic Markets?, *World Bank Policy Research Working Paper* 4973, June.

Chinn, M.D. and H. Ito. 2006. What matters for financial development? Capital controls, institutions and interactions, *Journal of Development Economics*, 81, 163–192

Claessens, S., A. Demirgüc-Kunt, and H. Huizinga. 2001. How Does Foreign Entry Affect Domestic Banking Markets? *Journal of Banking & Finance*, 25, 891–911.

Claessens, S. and N. Van Horen. 2011. Foreign Banks: Trends, Impact and Financial Stability. *DNB Working Paper* 330.

Claessens, S. and N. Van Horen, 2013. Foreign Banks: Trends and Impact. *Journal of Money, Credit and Banking*. Supplement to Vol. 46, No. 1, 295-326, 2014.

Cull, R., and M.S. Martinez Peria. 2010. Foreign Bank Participation in Developing Countries: What Do We Know About the Drivers and Consequences of This Phenomenon?, *World Bank Policy Research Working Paper* 5398.

Detragiache, E., T. Tressel, and P. Gupta. 2008. Foreign Banks in Poor Countries: Theory and Evidence. *The Journal of Finance* 63, 2123–2160.

Djankov, S., C. McLiesh and A. Shleifer. 2007. Private Credit in 129 Countries. *Journal of Financial Economics,* 84, 299–329.

Eichengreen, B. 2001. Capital Account Liberalization: What Do Cross-Country Studies Tell Us? *The World Bank Economic Review* 15 (3): 341–365.

Gambacorta, L., J. Yang and K. Tsatsaronis. 2014. Financial Structure and Growth. *BIS Quarterly Review,* March 2014

Johnston, R. B., C. Echeverria, and Salim M. Darbar. 1997. Sequencing Capital Account Liberalization-Lessons from the Experiences in Chile, Indonesia, Korea, and Thailand (EPub), International Monetary Fund.

Kaufmann, D., A. Kraay and P.Z. Lobaton. 1999. Governance Matters. *World Bank Research Paper* 2196, October.

Kose, M.A., E. Prasad, and A. D. Taylor. 2011. Thresholds in the Process of International Financial Integration. *Journal of International Money and Finance* 30 (1): 147–179.

La Porta, R., Lopez-de-Silanes, F., Shleifer, A., Vishny, R., 1998. Law and finance. *Journal of Political Economy* 106, 1113–1155.

Lane, P. and G. Milesi-Ferretti. 2007. The External Wealth of Nations Mark II, *Journal of International Economics* 73, November, 223-250.

Levine, R. 1996. Foreign Banks, Financial Development, and Economic Growth. *International Financial Markets: Harmonization Versus Competition* 7: 224–254.

Martinez Peria, M.S., and A.Mody. 2004. "How Foreign Participation and Market Concentration Impact Bank Spreads: Evidence from Latin America." *Journal of Money, Credit, and Banking* 36 (3): 511–537.
Mishkin, F.S. 2001. Prudential Supervision: Why Is It Important and What Are the Issues?" In *Prudential Supervision: What Works and What Doesn't*, 1–30. University of Chicago Press.

Ouyang, A. and R.S. Rajan. 2014. What Determines External Debt Tipping Points?, *Journal of Macroeconomics*, 39 (A), 2014, pp.215-225.

Rajan, R.G. and L. Zingales. 2003. The Great Reversals: the Politics of Financial Development in the Twentieth Century, *Journal of Financial Economics*, 69, 5-50.

Windmeijer, F., 2005. A Finite Sample Correction for the Variance of Linear Efficient Two-Step GMM Estimators, *Journal of Econometrics* 126, 25–51.

Van Horen, N. 2013. Foreign Banks: Access to Finance and Financial Stability, in: V. Acharya, T. Beck, D. Evanoff, G. Kaufman and R. Portes (eds), The social value of the financial sector, Too big to fail or just too big?, World Scientific Studies in International Economics 29, 323-344.

Tables and Figures

Table 1: Baseline Fixed Effects Estimates: Full Sample

Dep Var: Private Credit to GDP (%)	***Baseline (1)***	***(1) with Foreign Bank Assets***
GDP Per Capita	0.0034*** (0.0020)	0.0039*** (0.0022)
Ln Inflation Rate	0.8321 (0.9162)	2.1759** (1.0353)
Public Debt (%)	0.0054 (0.0547)	-0.0416 (0.0565)
Exchange Rate Regime	-0.7257 (1.0816)	-0.6288 (0.9298)
Bank Z-score	-0.2706** (0.1516)	-0.2199** (0.1174)
Legal Rights	1.6299 (2.182)	1.5739* (1.6732)
Creditor Information	2.8643*** (0.8460)	2.0971*** (0.8414)
Corruption	6.4440** (4.7662)	9.2903** (5.0531)
Foreign Bank Assets (%)		0.0888** (0.0546)
Country Fixed Effects	*Yes*	*Yes*
Time Fixed Effects	*Yes*	*Yes*
Constant	12.9113	12.3388
R-Squared	0.28	0.30
Number of Observations	516	436
Number of Countries	55	54

*** Significant at the 1% level; ** Significant at the 5% level; * Significant at the 10% level.
Robust Standard Errors Adjusted for Countries in Parenthesis

Table 2: Fixed Effects Estimates: Income Thresholds (Full Sample)

Dep Var: Private Credit to GDP (%)	*Baseline (1)*	*(1) with FBA and Linear Interaction (2)*	*(1) with FBA and Quadratic Interaction (3)*
GDP Per Capita	0.0100** (0.0049)	0.0107** (0.0053)	0.0116** (0.0052)
GDP Per Capita Squared	-2.15e-07*** (1.19e-07)	-2.26e-07* (1.23e-07)	-2.08e-07* (1.19e-07)
Ln Inflation Rate	2.5402*** (1.0325)	2.5560*** (1.0153)	2.6570*** (0.9763)
Public Debt (%)	-0.0557 (0.0591)	-0.0526 (0.0607)	-0.0491 (0.0609)
Exchange Rate Regime	-0.5473 (0.9521)	-0.5911 (0.9254)	-0.6634 (0.9146)
Bank Z-score	-0.2155** (0.1128)	-0.2132* (0.1125)	-0.2052* (0.1114)
Legal Rights	1.6453 (1.6822)	1.6359 (1.6706)	1.6060 (1.6691)
Creditor Information	1.8566** (0.7892)	1.8255** (0.7851)	1.7766** (0.7942)
Corruption	6.7744** (4.3816)	6.6999** (4.4900)	6.4976** (4.5279)
Foreign Bank Assets (%)	0.0915** (0.0544)	0.1114** (0.0739)	0.1159** (0.0491)
FBA*GDPPC		-7.07e-06* (0.000028)	
FBA*GDPPC^2			-1.88e-09** (2.54e-09)
Country Fixed Effects	*Yes*	*Yes*	*Yes*
Time Fixed Effects	*Yes*	*Yes*	*Yes*
Constant	-1.83	-3.88	-7.05
R-Squared	0.33	0.33	0.33
Number of Observations	436	436	436
Number of Countries	54	54	54

*** Significant at the 1% level; ** Significant at the 5% level; * Significant at the 10% level.
Robust Standard Errors Adjusted for Countries in Parenthesis

Table 3: Baseline Fixed Effects Estimates: Income-Based Sub-Samples

	(1)	(2)	(3)	(4)	(5)
Dep Var: Private Credit to GDP (%)	***Developing Economies***	***Emerging Economies***	***High Income***	***Middle Income***	***Low Income***
GDP Per Capita	0.00811*	0.00409*	0.00205	0.00769**	0.0124*
	(0.00485)	(0.00221)	(0.00169)	(0.00592)	(0.00736)
Ln Inflation Rate	0.418	2.621*	1.340	4.078**	0.259
	(0.915)	(1.398)	(2.515)	(1.701)	(0.757)
Public Debt (%)	-0.0810*	0.0169	0.105	0.0147	-0.107***
	(0.0434)	(0.0889)	(0.318)	(0.116)	(0.0366)
Exchange Rate Regime	-1.399	-0.294	-0.925	-0.390	0.194
	(1.042)	(0.965)	(2.084)	(1.241)	(0.699)
Bank Z-score	0.0273	-0.293**	-1.320	-0.169	-0.234
	(0.123)	(0.130)	(1.244)	(0.161)	(0.147)
Legal Rights	0.476	1.006	8.844	0.759	3.890***
	(1.398)	(1.727)	(6.347)	(1.284)	(0.867)
Creditor Information	1.439*	3.964***	-2.828	3.599**	1.228*
	(0.753)	(1.178)	(3.408)	(1.543)	(0.685)
Corruption	4.854*	22.46**	20.02	14.91**	1.041
	(2.503)	(9.378)	(18.65)	(11.75)	(2.808)
Foreign Bank Assets (%)	0.127*	0.0741	-0.178	0.150**	0.109**
	(0.0725)	(0.0690)	(0.214)	(0.0673)	(0.0370)
Country Fixed Effects	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Time Fixed Effects	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Constant	34.91	8.269	-2.445	-4.957	1.298
Number of Observations	163	273	67	200	169
R-squared	0.42	0.41	0.64	0.35	0.45
Number of Countries	21	33	9	23	22

*** Significant at the 1% level; ** Significant at the 5% level; * Significant at the 10% level.
Robust Standard Errors Adjusted for Countries in Parenthesis

Table 4: Fixed Effects Estimates: Emerging vs. Developing Economies

Dep Var: Private Credit to GDP (%)	Developing Economies			Emerging Economies		
	Baseline (1)	***(1) with FBA and Linear Interaction (2)***	***(1) with FBA and Quadratic Interaction (3)***	***Baseline (4)***	***(1) with FBA and Linear Interaction (5)***	***(1) with FBA and Quadratic Interaction (6)***
GDP Per Capita	0.0029 (0.0075)	0.0035 (0.0076)	0.0037 (0.0074)	0.0107** (0.0050)	0.0151*** (0.0060)	0.0143*** (0.0055)
GDP Per Capita Squared	-8.37e-07 (6.65e-07)	-8.67e-07 (6.52e-07)	-7.98e-07 (5.50e-07)	-2.20e-07* (1.19e-07)	-2.86e-07** (1.35e-07)	-2.18e-07* (1.16e-07)
Ln Inflation Rate	0.3620 (0.8270)	0.3501 (0.8229)	0.2841 (0.8143)	3.0523** (1.4246)	3.2176** (1.3500)	3.4371*** (1.2524)
Public Debt (%)	-0.0891** (0.0425)	-0.0808 (0.0508)	-0.0733 (0.0521)	0.0082 (0.0971)	0.0408 (0.0908)	0.0303 (0.0938)
Exchange Rate Regime	-1.2635 (0.9997)	-1.3831 (1.054)	-1.3285 (1.0334)	-0.1877 (1.0235)	-0.2396 (0.9491)	-0.3860 (0.9408)
Bank Z-score	-0.0115 (0.1349)	-0.0081 (0.1318)	-0.0090 (0.1301)	-0.2668** (0.1295)	-0.2556** (0.1263)	-0.2436* (0.1273)
Legal Rights	0.5793 (1.3326)	0.5584 (1.3045)	0.3108 (1.2611)	1.2238 (1.7858)	1.3222 (1.6057)	1.2617 (1.7137)
Creditor Information	0.9297 (0.8418)	0.9649 (0.8562)	0.8658 (0.8353)	3.5463*** (1.1095)	3.5511*** (1.1300)	3.5040** (1.1356)
Corruption	4.3033 (2.2818)	4.5328* (2.2791)	4.7141** (2.3029)	17.4595** (8.6396)	16.5203* (9.0166)	16.3997* (8.8844)
Foreign Bank Assets (%)	0.1294* (0.0709)	0.1555** (0.0752)	0.1551** (0.0754)	0.0782 (0.0699)	0.2205* (0.1206)	0.1402*** (0.0577)
FBA*GDPPC		-0.00002 (0.00001)			-0.00003 (.00003)	
FBA*GDPPC^2			-5.81e-09 (1.44e-09)***			-3.56e-09 (3.28e-09)
Country Fixed Effects	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Time Fixed Effects	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Constant	24.89	23.82	23.60	-12.34	-29.75	-10.31
R-Squared	0.45	0.46	0.48	0.45	0.45	0.45
Number of Observations	163	163	163	273	273	273
Number of Countries	21	21	21	33	33	33

*** Significant at the 1% level; ** Significant at the 5% level; * Significant at the 10% level.
Robust Standard Errors Adjusted for Countries in Parenthesis

Table 5: Fixed Effects Estimates: Regional Sub-Samples

Dep Var: Private Credit to GDP (%)	*MENA (1)*	*LAC (2)*	*ECA (3)*	*Asia (4)*	*SSA (5)*
GDP Per Capita	0.0045 (0.0077)	0.0036 (0.0091)	0.0344*** (0.0090)	0.0792*** (0.0246)	0.0051 (0.0213)
GDP Per Capita Squared	$8.49e^{-08}$ ($1.82e^{-07}$)	$-2.70e^{-07}$ ($3.92e^{-07}$)	$-5.81e^{-07}$ ($3.59e^{-07}$)	$2.74e^{-06}$*** ($6.95e^{-07}$)	$1.94e^{-06}$ ($2.68e^{-06}$)
Ln Inflation Rate	-1.8476** (0.7626)	0.3477 (1.5337)	2.7113* (1.4611)	3.7693 (2.5141)	-0.4616 (0.6437)
Public Debt (%)	0.3589** (0.1297)	-0.0074 (0.0865)	-0.1417 (0.0851)	-0.1760 (0.1938)	-0.00068 (0.0257)
Exchange Rate Regime	0.0664 (0.8616)	-1.5476 (1.3052)	0.1736 (2.1263)	2.8002 (1.9387)	0.1648 (0.5241)
Bank Z-score	0.0235 (0.1946)	0.2014 (0.2078)	-0.5852 (0.3594)	0.5634 (0.4414)	0.0882* (0.0475)
Foreign Bank Assets (%)	0.3397 (0.4208)	0.1911* (0.0966)	0.1235 (0.0790)	-0.1926 (0.2348)	0.0275 (0.0282)
FBA*GDPPC^2	$-1.38e^{-09}$ ($1.16e^{-09}$)	$-4.85e^{-09}$* ($2.55e^{-09}$)	$-1.42e^{-08}$*** ($2.69e^{-09}$)	$-1.96e^{-08}$** ($6.87e^{-09}$)	$-5.62e^{-09}$ ($5.76e^{-09}$)
Country Fixed Effects	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Time Fixed Effects	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
R-Squared	0.81	0.37	0.81	0.67	0.72
Number of Observations	47	137	156	86	91
Number of Countries	7	13	16	8	11

*** Significant at the 1% level; ** Significant at the 5% level; * Significant at the 10% level.
Robust Standard Errors Adjusted for Countries in Parenthesis

Table 6: Arellano-Bond Two-Step GMM Estimates

	(1)
Dep Var: Private Credit to GDP (%)	**Arellano-Bond Two-Step GMM**
L. Private Credit to GDP (%)	0.649***
	(0.125)
L. Foreign Bank Assets (%)	0.173**
	(0.0835)
LD.GDPPC	0.0170**
	(0.00815)
D.GDPPC^2	-2.05e-07***
	(4.76e-08)
LD. Ln Inflation Rate	0.790
	(1.200)
D. Public Debt (%)	0.0979***
	(0.0361)
D. Exchange Rate Regime	2.4415
	(0.782)
LD. Bank Z Score	0.181*
	(0.112)
D. Legal Rights	0.657
	(2.005)
D. Creditor Information	1.438**
	(0.7487)
D. Corruption	0.2883
	(8.232)
Observations	189
Number of Countries	49
Instruments for Differenced Equation:	
GMM-Type	Lags (2): Private Credit to GDP Lags (1): Foreign Bank Asset
Standard Instruments	First Difference of all exogenous variables
Arellano-Bond Test for Zero Autocorrelation in First-Differenced Errors (P values)	
Order 1	0.9487
Order 2	0.7783

*** Significant at the 1% level; ** Significant at the 5% level; * Significant at the 10% level.
Note: Windmeijer Bias-Corrected Robust Standard Errors in Parenthesis
D – First Difference; LD – Lagged Difference; L - Lagged

Table 7: Instrumental Variable TSLS Estimation

Dep Var: Private Credit to GDP (%)	(1)	(2)
	IV Model 1	**IV Model 2**
L. Foreign Bank Assets (%)	0.129**	0.158***
	(0.0515)	(0.0506)
L. GDPPC	0.0131***	0.0131***
	(0.00178)	(0.00178)
L. $GDPPC^2$	-2.66e-07***	-2.67e-07***
	(5.33e-08)	(5.35e-08)
L. Ln Inflation Rate	2.415***	2.415***
	(0.678)	(0.681)
L. Public Debt (%)	-0.105***	-0.106***
	(0.0331)	(0.0332)
L. Exchange Rate Regime	-0.467	-0.438
	(0.603)	(0.606)
L. Bank Z-Score	-0.247**	-0.250**
	(0.0998)	(0.100)
L. Legal Rights	2.154**	2.188**
	(0.938)	(0.942)
L. Creditor Information	1.036	0.957
	(0.649)	(0.651)
L. Corruption	7.297**	7.053**
	(2.960)	(2.971)
Constant	-8.663	-9.631
	(7.369)	(7.391)
Observations	388	388
Number of Countries	54	54
Primary Instrument	L. Foreign Bank	Population Density

*** Significant at the 1% level; ** Significant at the 5% level; * Significant at the 10% level.

Table 8: Alternative Measures of Financial Depth (Full Sample)

	Dep Var: Stock Market Capitalization (1)	*Dep Var: Private Bond Market Capitalization (2)*
GDP Per Capita	0.0079 (0.0061)	0.0081* (0.0046)
GDP Per Capita Squared	$6.03e^{-08}$ ($1.30e^{-07}$)	$-2.16e^{-07}$ ($1.51e^{-07}$)
Ln Inflation Rate	6.7448 (4.3187)	0.1887 (0.4187)
Public Debt (%)	-0.2978 (0.3249)	0.1063*** (0.0376)
Exchange Rate Regime	-3.3012 (5.4817)	0.5313 (0.9091)
Bank Z-score	0.3534 (0.9788)	-0.0441 (0.0417)
Legal Rights	7.0522*** (2.1761)	0.2166 (0.4119)
Creditor Information	0.2714 (2.1194)	0.1374 (0.3942)
Corruption	-16.8731 (12.4630)	-2.6126 (1.9541)
Foreign Bank Assets (%)	0.3105** (.1487)	0.1361* (0.0690)
FBA*GDPPC^2	$-5.50e^{-09}$** ($2.68e^{-09}$)	$-2.32e^{-09}$ ($2.04e^{-09}$)
Country Fixed Effects	*Yes*	*Yes*
Time Fixed Effects	*No*	*No*
Within R-Squared	0.17	0.33
Number of Observations	342	126
Number of Countries	44	14

*** Significant at the 1% level; ** Significant at the 5% level; * Significant at the 10% level.
Robust Standard Errors Adjusted for Countries in Parenthesis

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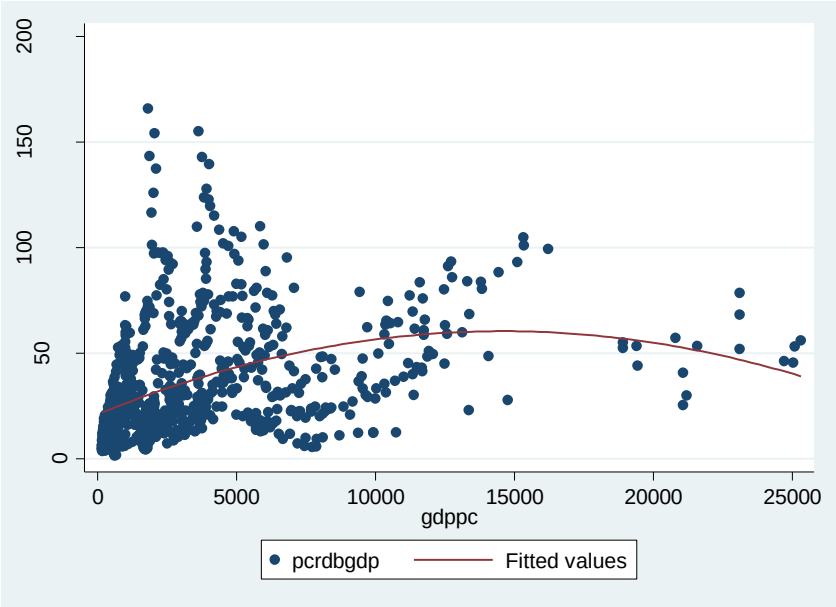

Note: Proxy for financial depth – Banking Credit to Private Sector

Figure 1: Relationship between Financial Depth and GDP Per Capita

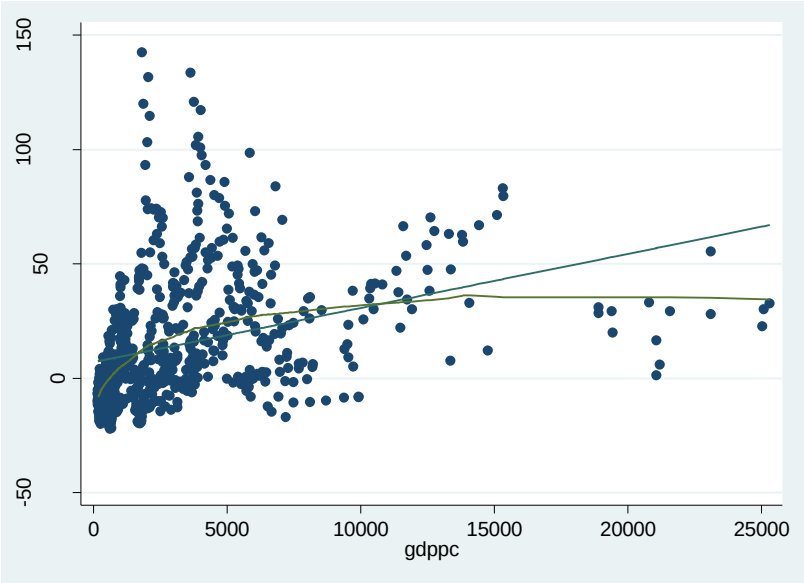

Figure 2: ACPR Plot: Banking Credit to Private Sector and GDP Per Capita