# Do trade and financial openness matter for financial development? Bank-level evidence from emerging market economies

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## Abstract

Openness theory of financial development argues that opening up a country to both international trade and financial flows can promote financial development. Extending this theory, I examine the impact of recent rapid trade and financial openness of emerging economies on their banks' development. Three indicators of bank development are used to distinguish the cost, volume and risk of bank credit. Using a panel dataset of 287 key banks from 37 emerging countries over the period 2000-2012, I find robust evidence that higher trade openness promotes bank development by increasing the volume and decreasing the cost and risk of bank credit. I identify that these results are driven, respectively, by the higher demand for finance, the domestic financial sector liberalization reforms and the lending diversification opportunities caused by the higher trade-openness. Contrary, I find that the role of financial openness for bank development is limited because though the intense credit market competition caused by the capital inflows in financially open countries urges the banks to cut the cost of credit, however it also forces them to increase risk-taking despite the lower volumes of credit extended. In such a scenario, the costs associated with higher bank risk-taking might outweigh the benefits associated with the lower cost of bank credit.

***Keywords:*** trade openness; financial openness; bank risk-taking; bank net interest margins; bank lending

# 1. Introduction

Both the theoretical and empirical research have provided ample evidence that financial development promotes economic growth (see, for example, Levine (2005) for a review of this literature). Then the question arises why some countries remain financially underdeveloped as compared to others. Many argue that the causes of this difference lie in legal systems (La Porta *et al.* 1997; La Porta *et al.* 1998), political institutions (Roe 2006) and cultures (Stulz & Williamson 2003) that are different across countries. Another important cause of this difference, identified by the small but growing number of recent studies, is openness. Openness theory of financial development argues that the integration of a country in global goods and capital markets can promote financial development (Rajan & Zingales 2003). Existing empirical literature on the nexus between openness and financial development is macro-level and largely reports conflicting evidence. In this study, I shed light on this nexus from a micro perspective by examining the impact of trade and financial openness on individual banks' development. Specifically, I examine how recent rapid openness of emerging economies to international trade and financial flows has impacted the cost, volume and risk of financing by the banks in these countries.

Openness theory of financial development argues that established incumbent industrial and financial interest groups oppose financial development because it breeds competition by easing the entry of new firms into the market and, thus, erodes the monopolistic rents of the incumbent groups (Rajan & Zingales 2003). Trade and financial openness bring in foreign competition and reduce the power of incumbent groups who oppose financial development. Openness to trade and capital flows, not only, limits the incumbents' ability to oppose financial development, but it also generates incentives for them to support and promote financial development. An economy should open to both trade and capital flows simultaneously because one without the other would not give the desired results. Trade openness without financial openness is likely to result in more loan subsidies and financial repression. Whereas financial openness without trade openness will only allow the largest domestic firms to tap foreign capital markets but will not allow small, potentially growing but financially constraint domestic firms to access foreign funds.

Recently, a handful of studies have examined the arguments of openness theory empirically (Baltagi *et al.* 2009; Law 2009; Hauner *et al.* 2013). There are at least two shortcomings of the empirical evidence provided by these studies: First, the findings reported are conflicting and inconclusive. For instance, Baltagi *et al.* (2009) find that trade and

financial openness individually have significant effect on banking sector development, while Hauner *et al.* (2013) suggest that trade openness is a robust predictor of domestic financial development, whereas the impact of financial openness on domestic financial development is not consistent.

Second, all these studies are at macro-level and proxy banking sector development (i.e., financial development) with aggregate country-level private credit to GDP ratio measured as 'private credit provided by the banking sector as a percentage of GDP'. The use of country-level private credit to GDP ratio to examine the arguments of openness theory has two limitations. First is that the country-level ratio doesn't give information about the rents earned by the individual banks and, hence, the cost of financial intermediation. This limitation is significant because one main argument of the openness theory is that the openness promotes financial development by reducing the rents of incumbent financial interest groups (Rajan & Zingales 2003). Contrary, one can also expect higher bank rents as a result of higher openness. Since the openness brings in foreign competition, it can create pressure on local banks (which tend to have lower operational costs) to merge in order to remain competitive. The resulting market concentration could create monopoly power resulting in higher rents for key players and overall lower efficiency of the banking system (Agénor 2003; Yoo 2016). Second limitation is that the macro-level analysis does not give information about the impact of openness on default risk of individual banks. A recently expanding strand of theories suggests that there is always an optimal level of private credit depending upon the economic situation of a country and excessive lending, beyond the optimal level and accompanied with lower credit standards, just accumulates higher financial sector risks (Cecchetti & Kharroubi 2012; Ductor & Grechyna 2015). Consistently, recent empirical studies have shown that financial crises are more likely when private credit to GDP ratio is larger (Borio & Drehmann 2009; JordÀ *et al.* 2013). Since trade openness increases the demand for finance while financial openness provides new sources of finance, an increase in the country-level private credit to GDP ratio might be due to the speculative lending accompanied with weak credit standards that just increase the default risk of individual banks.

The existing inconclusive evidence boils down the arguments of openness theory to further empirical investigation. Further, the limitations of country-level private credit to GDP ratio as a measure of banking sector development warrant an analysis using bank-level data. Closing these research gaps is the purpose of this paper.

I use three indicators to measure bank development at micro-level: the cost, volume and risk of credit provided by the banks. The cost of bank credit is measured with annual net

interest margins of each bank (annual interest income to earning assets ratio is used as an alternative proxy in robustness tests). The volume of bank credit is measured with bank annual gross loans to total assets ratios and show the proportion of bank assets allocated to private investments. The risk of bank credit (or, alternatively, bank risk-taking) is measured with bank z-scores and represents the probability of banks' default (annual non-performing loans to gross loans ratio is used as an alternative proxy in robustness tests). The use of three indicators would give the information about the cost and risk of bank credit in addition to its volume and would eliminate the limitations of macro-level analysis which just measures the aggregate volume of the bank credit.

Openness can promote bank development by increasing the volume, and decreasing the cost and risk of credit provided by the banks. Trade and financial openness can impact the indicators of bank development through different channels: Trade openness is expected to decrease the cost of bank credit by fostering the reforms that liberalize domestic financial sector such as bank privatizations, deregulations, interest rate liberalization, or policies to develop capital markets (Barlow & Radulescu 2005; Hauner *et al.* 2013). Liberalization reforms might be due to internal pressure from those interest groups who are likely to gain from financial development (Rajan & Zingales 2003; Braun & Raddatz 2008) or external pressures from international organizations and major trading partners. Trade openness is likely to increase the credit provided by the banks by increasing the demand for loans to establish new production facilities and meet higher working capital needs to produce and sell in international markets. Finally, trade openness might decrease banks' risk-taking by providing diversification opportunities and decreasing the adverse selection of borrowers due to higher loan demand[1]. On the other hand, financial openness is expected to decrease the cost of bank credit by providing the access to international financial markets. The access to international financial markets would increase the competition in credit market forcing banks to charge lower rates on loans. Financial openness can increase the volume of bank credit because it provides opportunities to domestic banks to borrow cheap funds from international sources and lend to domestic borrowers. Finally, financial openness might decrease banks' risk-taking by providing the international diversification opportunities[2].

For empirical analysis, I collected bank-level data from a sample of 37 emerging countries which have experienced significant trade and financial openness over the period

[1] Trade openness might result in higher probability of bank default by exposing banks to international shocks.
[2] Financial openness might result in higher probability of bank default by exposing banks to international shocks and increasing competition in deposit and credit markets.

from 2000 to 2012. To obtain an appropriate sample of banks, I kept up to a maximum of 10 key banks from each country. I define a bank as the key financial institution if it has been ranked in top ten banks of a country during most of the sample years. For empirical analysis, I specified dynamic GMM panel models to estimate the impact of trade and financial openness on the cost and volume of bank credit, while a static panel model is specified to examine the impact of openness variables on bank risk-taking. These models estimate how the changes in trade and financial openness cause changes in the cost, volume and risk of bank credit.

I find robust evidence that higher trade openness increases the volume and decreases the cost and risk of bank credit. Contrary, I find that though higher financial openness decreases the cost of bank credit, however it decreases the volume of bank credit and increases bank risk-taking. Overall the findings of this study support that trade openness results in a low cost (i.e., efficient), large and safe banking sector. While the role of financial openness for bank development is limited because the costs associated with higher bank risk might outweigh the benefits associated with the lower cost of credit.

This study contributes to various strands of existing literature: *First,* the most important contribution is to the openness theory of financial development (Rajan & Zingales 2003; Braun & Raddatz 2008; Baltagi *et al.* 2009; Law 2009; Hauner *et al.* 2013). Rajan and Zingales (2003) initiated the theory that trade and financial openness can cause financial development by reducing the rents of incumbent industrial and financial interest groups. Later studies have examined the impact of openness on financial development at macro-level and report largely conflicting evidence (Baltagi *et al.* 2009; Law 2009; Hauner *et al.* 2013). I extend this debate and examine the impact of openness variables on micro-level banks' development. I identify the channels through which openness can impact banks' development at micro-level.

*Second,* my analysis complements to the literature that examines the cross-country determinants of bank net interest margins (Demirgüç-Kunt & Huizinga 1999; Demirguc-Kunt *et al.* 2004; Kasman *et al.* 2010; Tan 2012; Dietrich & Wanzenried 2014). To the best of my knowledge, this study is first which explicitly examines the impact of trade and financial openness on bank net interest margins.

*Third,* this study complements the study of Cole and Turk (2013) who examine the impact of legal institutions on bank lending behavior. In this regard, I analyze the impact of trade and financial openness on bank lending behavior.

*Fourth,* this study adds to a currently expanding literature that aims to explain the cross-country variation in bank risk-taking behavior. Extant literature has focused on banking

industry structure (Boyd & De Nicolo 2005; Martinez-Miera & Repullo 2010), macroeconomic indicators such as GDP growth, inflation, unemployment rates, etc. (Ali & Daly 2010; Festić *et al.* 2011; Castro 2013; Bouvatier *et al.* 2014; Chaibi & Ftiti 2015), level of financial development (Vithessonthi 2014), legal institutions (Houston *et al.* 2010; Cole & Turk 2013), political institution (Ashraf 2017) and national culture (Ashraf *et al.* 2016c), as significant determinants of cross-country variation in bank risk-taking. I add to this literature by analyzing the impact of trade and financial openness on bank risk-taking behavior.

*Fifth*, this study provides a new framework to measure bank development at micro level. In this regard, a banking sector is developed if the banks extend higher volume of loans at low cost and have lower probability of default. This framework simultaneously captures the ability of micro-level banks to withstand against competition[3] by extending more loans without loosening the credit standards.

The rest of the study proceeds as follows. Section 2 presents the hypotheses. Section 3 introduces data and variables. Section 4 describes empirical methodology. Section 5 presents empirical results. Final section concludes the study.

## 2. Hypotheses development

In this section, I develop testable hypotheses to examine the impact of trade and financial openness on the cost, volume and risk of bank credit.

### 2.1 Openness and the cost of bank credit

It is common especially in developing countries that a small number of key financial institutions (or, established large financial firms in an economy) have strong market power and can earn higher rents (Rajan & Zingales 2003; Beck *et al.* 2009). There might be multiple reasons that the key incumbent financial institutions can enjoy high rents: First, direct lenders may lobby with government for favorable regulations that ensures that they are the sole creditors for financial transactions. Second, industrial incumbent groups may lobby for restrictive financial sector regulations because a competitive banking sector might finance new firms thereby increasing the competition and reducing the profits of existing industrial groups. Third, main lenders monopolize the private information of borrowers by establishing strong relations with those who control or have strong influence over borrowing firms (e.g., managers, suppliers, politicians, other lenders etc.). Fourth, it is easy for few large lenders to

[3] Lower bank net interest margins represent higher competitive pressure.

establish a friendly cartel with each other and leaving no option for depositors and borrowers. Trade and financial openness can decrease these rents by promoting financial sector liberalization reforms and providing the access to international financial markets, respectively.

Trade openness forces policy makers to initiate reforms that liberalize domestic financial sector such as improving the quality of regulations, liberalizing interest rates, bank privatizations and/or policies to develop securities markets (Barlow & Radulescu 2005; Hauner *et al.* 2013). One reason of reforms is the pressure from multilateral international organizations, such as World Trade Organization, or from specific trading partners[4]. For example, the provisions of the WTO's General Agreement on Trade in Services (GATS) prohibit commonly recommended financial policies, including size limits on banks, firewalls between banking and investment services, bans on risky financial services and other capital management mechanisms. Another reason of reforms is the pressure from within the country as suggested by the political economy theories of resource distribution (Rajan & Zingales 2003; Braun & Raddatz 2008). Trade openness increases product market competition by bringing in foreign more efficient industrial firms. The entry of foreign firms reduces the profits and cash holdings for domestic firms, on the one hand, and outside opportunities as well as the need to defend domestic markets against superior foreign technologies increase the need for domestic firms to invest more, on the other hand. Consequently, the incumbent firms look for cheap financing which is difficult to obtain in high cost relationship lending. Hence, these industrial incumbents will stress for reforms that encourage financial development in the form of competitive banking sector and efficient financial markets. As the banking sectors become competitive, the rents of incumbent financial institutions and hence the cost of bank credit for firms are likely to decrease.

Higher financial openness is expected to intensify credit market competition by providing the access to international financial markets. The competition in credit market increases because the borrowers get the chance to borrow from international sources in addition to borrow loans from domestic banks. If all else equal, the banks would charge lower rates on loans to sustain market share. This again would likely to decrease the cost of bank credit for firms.

Rajan and Zingales (2003) suggest the simultaneous openness to both trade and financial flows because one without the other is not likely to produce desired results. To

[4] US-Viet Nam Bilateral Trade Agreement requires Vietnam to liberalize banking sector.

examine this effect, I also add a hypothesis about the joint effect of both types of openness on the cost of bank credit. Thus, the first set of hypotheses is as follows:

***H-1a:*** *Higher trade openness decreases the cost of bank credit*

***H-1b:*** *Higher financial openness decreases the cost of bank credit*

***H-1c:*** *higher trade and financial openness decrease the cost of bank credit jointly.*

## 2.2 Openness and the volume of bank credit

Trade openness may increase the volume of bank credit (or, alternatively, bank lending) by increasing the demand for both long-term and short-term financing. With the increase in international trade, domestic firms need more and better production facilities to produce for international markets. This is likely to increase demand for long-term financing for domestic capital formation (Huang & Temple 2005). Firms also need to maintain higher working capital to produce and sell in international markets due to longer operating cycles (Foley & Manova 2014)[5]. To support working capital, firms are likely to increase short-term bank financing. This increase in demand for financing will encourage banks to allocate more assets to loans as compared to other low return assets such as government securities.

Higher financial openness might increase bank credit through the access to international financial markets and intense credit market competition. Without financial openness, the supply of credit depends solely on its availability within the country. However, financial openness provides the opportunity for domestic banks to borrow cheap funds from international sources and lend to domestic borrowers. Similarly, the intense credit market competition caused by the higher financial openness is likely to force banks to charge lower interest rates on loans to sustain market share which would put a downward pressure on bank profits. One way to compensate for lower profits and to maintain a sufficient return on shareholders' equity is to increase investments in loans which pay higher return. Alternatively, the access to international financial markets and intense credit market competition may result in lower bank credit. For instance, bank credit would decrease if most of the domestic borrowers prefer international financial sources rather than to borrow from domestic banks. Similarly, intense credit market competition can decrease markets shares of banks in lending market. However, for exposition purposes, I write second set of hypotheses in the following forms.

[5] Foley and Manova (2014) state that cross-border order shipments and deliveries typically take 60 days longer than domestic shipments.

***H-2a:*** *Higher trade openness increases the volume of bank credit*

***H-2b:*** *Higher financial openness increases the volume of bank credit*

***H-2c:*** *Higher trade and financial openness increase the volume of bank credit jointly*

## 2.3 Openness and bank risk-taking

Impact of trade openness on bank risk-taking is complex. Higher trade openness might decrease bank risk-taking by providing the diversification opportunities and improving the borrowers' selection (I name it 'diversification-stability effect'). For example, banks can diversify their investments between domestic and exporting firms. Borrowers, which are involved in international trade, spread their sales over multiple markets with different business cycles. Ample macro-level evidence is available that the sectors more integrated in international goods markets benefit from international diversification and are less affected by domestic financial conditions (Braun & Raddatz 2007; Wagner 2013). Similarly, micro-level evidence suggests that the firms participating in international trade have higher productivity and survival chances than the non-participating firms (see, for example, literature survey by Wagner (2012)). Thus, these borrowers are less likely to default on bank loans decreasing the bank risk. Further banks would be able to pursue better collateral standards due to the higher demand for bank financing caused by trade openness which would decrease the chances of adverse selection of borrowers.

Contrary, trade openness might increase bank risk-taking due to higher competition and volatility (I name it 'volatility-fragility effect'). Since the liberalization reforms caused by the trade openness increase competition and decrease the cost of bank credit, the banks are likely to increase average loans to compensate for reduced rents. While in competitive environment, the banks extend more loans by loosening the credit standards (Bushman *et al.* 2014) that result in more poor credit quality loans on bank balance sheets. Further, the tendency of these poor credit quality risks to materialize on bank balance sheets will be higher due to the higher uncertainty and income volatility (Newbery & Stiglitz 1984), the frequent domestic economic fluctuations (Blankenau *et al.* 2001; Arora & Vamvakidis 2005) and the vulnerability of domestic economy to international/external shocks (Loayza & RanciÈRe 2006) in higher trade openness countries. Thus the impact of trade openness on bank risk-taking is uncertain. However, for exposition purposes, I write my hypothesis in the following form.

***H-3a:*** *Higher trade openness decreases bank risk-taking*

Financial openness can decrease bank risk-taking because it provides opportunities for domestic banks to allocate their investments across multiple markets (i.e., 'diversification-stability effect'). Conversely, financial openness can also increase bank risk-taking through credit market competition[6] (i.e., 'volatility-fragility effect'). Higher financial openness would increase the supply of investable funds in a country due to the easy access to foreign capital. Higher supply of foreign funds is likely to increase competition in bank lending market and force banks to charge lower interest rates on loans. Consequently, the banks are more likely to switch to higher risk-taking strategy for mitigating the effects of this downward pressure on earned interest rates (Giannetti 2007). Numerous macro-level studies argue that higher financial openness of emerging economies, by increasing the volatile capital inflows and reducing the short-run profits of banks, leads to the repetitive financial crises (McKinnon & Pill 1997; Yeyati 1999; Giannetti 2007)[7]. Again for the exposition purposes, I write my hypothesis in the following form.

***H-3b:*** *Higher financial openness decreases bank risk-taking*

Again I add a hypothesis to examine the joint effect of trade and financial openness on bank risk-taking.

***H-3c:*** *higher trade and financial openness have a joint effect on bank risk-taking*

# 3. Data and Variables

## 3.1 Sample selection

The data used in this paper is compiled from various sources: Bank-level data is obtained from *Bankscope* database provided by Fitch-IBCA (International Bank Credit Analysis Ltd). Data for financial openness is collected from Chinn and Ito (2006, 2008). Data to measure trade openness and macroeconomic conditions of a country is obtained from World Development Indicators (WDI) of World Bank. Data for banking industry structure is

[6] Higher financial openness can also increase bank risk-taking through the deposit market competition. Due to the financial openness, domestic depositors get a chance to allocate their savings away from their home country to the more protective financial systems of developed countries due to higher financial openness. This international allocation of funds increases the competition among domestic banks for deposits. Intense competition in deposit market puts an upward pressure on interest rates which banks offer to depositors. Consequently, the banks can switch to higher risk-taking strategy to mitigate the adverse effects of higher deposit rates on bank cost (Bourgain *et al.* 2012).

[7] Some studies, such as Hamdi and Jlassi (2014) and Qin and Luo (2014) find mixed evidence regarding the impact of capital account openness on the probability of financial crisis in emerging markets.

collected from Financial Development database of World Bank. Data for country-level governance variables is obtained from World Governance Indicators of Kaufmann *et al.* (2011). Table 1 lists variables, variable definitions and their data sources briefly.

**(Insert Table 1 here)**

Since the main objective of this study is to examine the impact of trade and financial openness on bank development where bank development is measured in terms of cost, volume and risk of bank finance. Keeping in view this objective, I carefully selected the countries and banks to include in the study sample.

As to the countries' selection, I select a sample of emerging economies. Emerging economies are defined as the group of about 30-50 countries that are in a transition phase—not too rich, not too poor, and not too closed to foreign capital, with regulatory and financial systems that have yet to fully mature (By Christine Lagarde, Managing Director, International Monetary Fund, February 4, 2016). From this definition, openness and financial systems of emerging markets are in transition and evolving over time. Emerging economies[8] have experienced significant changes in trade and financial openness after the establishment of World Trade Organisation in 1995. Specifically the trade flows have observed significant increase from early 2000s to 2012. For example, emerging countries observed an annual 8 percent increase in their annual average exports, while the share of emerging countries in total world trade increased from 28 to 43 percent over the period from 2000 to 2012. Emerging economies have slowed down and their trade is largely steady after 2012 (IMF 2015). Therefore, the emerging countries over the period from 2000 to 2012 are a good laboratory for observing that how higher openness policy has affected banks' development in these countries. Different classifications are available for emerging markets such as emerging markets classification by Financial Times Stock Exchange (FTSE), Emerging Markets Bond Index Global (EMBI Global) by J.P. Morgan, Banco Bilbao Vizcaya Argentaria (BBVA) list of emerging markets, among others. I selected 40 emerging economies which appear in most of these classifications. However, I dropped Greece, Iran and Taiwan due to missing necessary data. Table 2 lists rest 37 countries included in the sample.

As to the banks' selection, I included a bank in sample if it was a key player in banking industry of its country and had operated for a considerable time-period over sample period facing different phases of trade and financial openness. Only key banks are included in the

[8] Another reason that I focus only on emerging countries group is that Henry (2007) suggests that including both developed and emerging countries in the same sample for examining the impact of capital-openness on real variables can lead to misleading conclusions.

sample because one main argument of the openness theory is that the openness increases banking sector development by decreasing the rents earned by the key incumbent financial interest groups. I downloaded balance sheet and income statement accounting data of all active and inactive commercial, cooperative and saving banks in 37 sample countries over the period from 2000 to 2012 from Bankscope database. Inclusion of inactive banks eliminates any survival bias in data. To select key players, I classify a bank as key player if it has remained in top ten banks of its country over most of the sample period. To properly estimate the effects of changes in trade and financial openness on changes in bank data, a key bank is kept in sample if it has necessary accounting data over at least 7 (almost half) sample years. Columns two and three in Table 2 report the number of banks and the total yearly bank observations per country.

Finally, I collected data of trade openness, financial openness and other country-level control variables and linked this country-level annual data with bank-level annual data. Final dataset consists of 3273 annual observations of 287 banks from 37 emerging economies over the period from 2000 to 2012. I wisorize all bank-level variables at 1 and 99 percent levels to eliminate outliers.

## 3.2 Measurement of variables

The cost of bank credit is measured with net interest margins[9]. Net interest margins (NIM) equals annual interest income earned on loans minus annual interest expense paid to depositors divided by annual total earning assets. NIM measures the spread between what a bank pays to the lenders of funds and what it gets from the borrowers of funds and thus reflects the cost of financial intermediation (Demirgüç-Kunt & Huizinga 1999). Demirguc-Kunt *et al.* (2004) use NIM to measure bank market power and rents. In developed and competitive banking sectors, the key banks are likely to earn lower NIM due to the lower market power. I also use interest income to average earning assets ratio (II_AEA) as an alternative proxy of the cost of bank credit in robustness tests.

The volume of bank credit is measured with bank annual gross loans to total assets ratios (GL_TA). GL_TA indicates the ratio of total assets which banks allocate to loans. Cole

[9] One may argue that the interest income to total earning assets ratio can be used to measure the cost of bank finance, however, I prefer net interest margins for this study given the arguments of openness theory that higher openness promotes financial development by reducing the rents of incumbent financial interest groups. The use of net interest margins takes into account both the overall bank rents and the cost of bank credit simultaneously. However, I use the interest income to total earning assets ratio as an alternative proxy of the cost of bank finance for robustness tests.

and Turk (2013) have used this variable to examine the impact of legal institutions on financial development at bank-level.

Following recent literature (Laeven & Levine 2009; Houston *et al.* 2010; Ashraf *et al.* 2016c), I measure bank risk-taking with z-scores. Z-score= (ROA+CAR)/σ(ROA), where ROA is equal to annual return on assets before loan loss provisions and taxes, CAR is equal to annual equity to total assets ratio, and σ(ROA) is equal to standard deviation of annual values of return on assets before loan loss provisions and taxes calculated over 3-year overlapping periods starting in 2000 and ending in 2012 (e.g., 2000–2002, 2001–2003 and so on). Z-score measures the number of standard deviations from mean value by which return has to fall to deplete all shareholders' capital. Higher values of z-score indicate lower probability of bank default. Further, as z-score is a highly skewed risk measure, therefore, following above-mentioned studies, I take log of z-scores and then multiply log of z-scores with -1 so that higher values represent higher probability of bank default. For brevity, I name it Z_score throughout rest of this paper. Due to the 3-year overlapping window used for calculating Z_score, the sample period for the empirical models incorporating Z_score as dependent variable starts from 2002. Since logged z-score defines insolvency risk on the domain of all real numbers, it is an attractive and unproblematic bank insolvency risk measure to use as a dependent variable in standard regression analysis (Lepetit & Strobel 2015). Non-performing loan to gross loans ratio (NPL_GL) is used as an alternative measure of the risk of bank credit in robustness tests.

Trade openness is measured with 'total trade to GDP ratio'. Specifically, Trade_Openness= (imports + exports)/ GDP, where imports, exports and GDP are measured in annual current US dollars. Total trade to GDP ratio as a measure of trade openness has the advantages of being well defined and clearly measured (Kim *et al.* 2010). Several recent studies have used total trade to GDP ratio as a proxy of trade openness (Do & Levchenko 2004; Huang & Temple 2005; Baltagi *et al.* 2009).

Financial openness is measured with Kaopen index developed by Chinn and Ito (2006) and Chinn and Ito (2008). Kaopen index represents capital account openness and measures the extent of openness in capital transactions based on information from the IMF's Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER). This index is constructed from four dummy variables that codify restrictions on capital account transactions, restrictions on current account transactions, the requirement for the surrender of export proceeds and the presence of multiple exchange rates. Each dummy variable takes a value equal to 1 if a particular capital account restriction is nonexistent. Chinn and Ito (2006, 2008) drive first

principle component of these four binary variables and use it as their Kaopen index. Higher values of Kaopen index represent higher level of cross-border openness to capital transactions. I rename Kaopen index as Financial_Openness for this study. Kaopen index as a proxy of financial openness has been widely used in recent literature (Baltagi *et al.* 2009; Bourgain *et al.* 2012; Cubillas & González 2014).

A number of bank-level variables are calculated to use as control variables in different empirical models: Log_TA, Equity_TA, Deposits_TA, NII_TR, LLP_TA, Growth_TA, Cost_Income and Govt_Bank. Log_TA is logarithm of annual total assets measured in thousand US dollars. Equity_TA is annual book value of equity to total assets ratio. Deposits_TA is annual total customer deposits to total assets ratio. NII_TR is annual non-interest income to total gross revenues ratio. LLP_TA is annual loan loss provisions to total assets ratio. Growth_TA is year-on-year growth in total assets of a bank. Cost_Income is annual total expenses to annual total revenue ratio. And Govt_Bank is a dummy variable equal to 1 if a bank is state-owned and 0 otherwise. All bank-specific variables are computed at fiscal year-end.

Banking industry structure might have a significant influence over individual bank net interest margins, loan ratios and risk-taking behavior (Demirgüç-Kunt & Huizinga 1999; Demirguc-Kunt *et al.* 2004; Boyd & De Nicolo 2005; Cole & Turk 2013). Therefore, I include banking industry structure variable, Bank_Concentration, in all empirical models. Bank_Concentration equals 'sum of annual assets of three largest banks as a percentage of total assets of all banks in a country.'

Since within-country as well as cross-country variation in bank net interest margins, loan ratios and risk-taking might be due to variation in macroeconomic circumstances (Demirgüç-Kunt & Huizinga 1999; Ali & Daly 2010; Cole & Turk 2013; Dietrich & Wanzenried 2014), I use three variables, Log_GDPPC, GDP_Growth and Inflation, to control for variation in macroeconomic conditions. Log_GDPPC equals natural logarithm of annual gross domestic product per capita, measured in current US dollars. GDP_Growth equals annual percentage growth in gross domestic product. Inflation equals percentage change in annual average consumer prices.

The level of stock market development is an alternative form of financial development[10]. Stock market development can influence bank behavior significantly by

[10] Openness may impact stock market development. For example, Lim and Kim (2011) find that higher trade openness is associated with higher informational efficiency of emerging stock markets.

increasing the competition in financial sector (Dietrich & Wanzenried 2014; Vithessonthi 2014). To control for this effect, I include Market_GDP variable to proxy for the level of stock market development in a country. Market_GDP equals annual market capitalization of listed companies to GDP ratio.

Since the financial intermediation costs (Demirguc-Kunt *et al.* 2004), bank lending (Djankov *et al.* 2007) and bank risk-taking (Houston *et al.* 2010) might be influenced by legal institutions, I include rule of law, Rule_of_Law, variable to control for legal institutional environment of countries.

Finally, the changes can occur in bank behavior during the financial crisis situation (Ashraf *et al.* 2016b), therefore I generate a dummy variable, Financial_Crisis, to include in all models. Financial_Crisis equals 1 if a country is categorized as in financial crisis situation by the Laeven and Valencia (2013)'s financial crisis database, and 0 otherwise.

## 4. Empirical methodology

To examine the impact of trade and financial openness on the cost and volume of bank credit in multivariate analysis, I specify following dynamic panel model:

$$Y_{i,j,t} = \alpha_i + \delta Y_{i,j,t-1} + \beta_1 Trade\_Openness_{j,t} + \beta_2 Financial\_Openness_{j,t} + \beta_3 (Trade * Financial)_{j,t} + \sum_{k=1}^{k} \beta_k X_{i,j,t}^{k} + \beta_4 Bank\_Concentration_{j,t} + \sum_{l=1}^{l} \beta_l X_{j,t}^{l} + \sum_{t=1}^{T-1} \epsilon_t D_t + u_i + \varepsilon_{i,j,t} \quad \_\_\_\_\_ Eq.(1)$$

Where *i*, *j* and *t* subscripts represent bank, country and year, respectively. Y represents dependent variable. Two dependent variables are used in Eq. (1): NIM is used as dependent variable to test hypotheses H-1a, H-1b and H-1c. GL_TA is used as dependent variable to test hypotheses H-2a, H-2b and H-2c. One period lag of Y is used as explanatory variable to control for persistent in dependent variable. The coefficient of lagged dependent variable, $\delta$, shows the speed of adjustment to equilibrium level. $\alpha_i$ is constant-term. Trade_Openness, Financial_Openness and Trade*Financial are three main independent variables of interest. Trade_Openness and Financial_Openness capture independent effects of trade and financial openness on bank net interest margins. While Trade*Financial is an interaction-term and captures the joint effect of trade and financial openness on bank net interest margins. $X_{i,j,t}^{k}$ is a

set of bank-level control variables including Log_TA, Equity_TA, Deposits_TA, NII_TR, Cost_Income and Govt_Bank. Bank_Concentration is a banking industry level-control variable representing the share of largest three banks. $X^{1}_{j,t}$ is a set of country-level macroeconomic, stock market development, institutional and financial crisis-period control variables including Log_GDPPC, GDP_Growth, Inflation, Market_GDP, Rule_of_Law and Financial_Crisis. Detailed definitions of all these variables are given in Section 3. $D_t$ are dummy variables representing year fixed-effects and control for global business cycles. $u_i$ represents the fixed effect of bank $i$ and $\mathcal{E}_{i,j,t}$ is an idiosyncratic error term.

This model has unobserved bank specific fixed effects, dynamic dependent variable and endogenous independent variable properties. For example, there are many bank specific unobserved characteristics such as boards, CEOs etc. as fixed effects which are not measured. Further, dependent variable, NIM, can constitute some persistence because of impediments to banking industry competition and higher informational opacity of banks (Berger *et al.* 2000). Finally, there can be endogeneity between net interest margins and other bank-level control variables. For example, banks which earn higher net interest margins can accumulate higher equity ratios easily. While well capitalized banks have higher ability to attract lower cost deposits and to lend at higher interest rates which further increase their net interest margins. Similar problem might occur with other bank-level control variables[11].

For a dynamic panel dataset having small T (13 years for this study) and large N (285 banks for this study) properties, with unobserved fixed-effects[12] and with endogeneity between dependent and independent variables, differenced (Arellano & Bond 1991) and system generalized method of moments (GMM) estimators (Arellano & Bover 1995; Blundell & Bond 1998) can be used. When coefficient of lagged dependent variable, $\delta$, is large, estimations with differenced GMM estimator are inefficient (Bond 2002). In this case, system GMM provides consistent estimates and is considered superior. Further GMM estimator is preferred if estimated value of $\delta$ with GMM estimator lies between the values estimated with OLS and fixed-effects estimators. I observe that $\delta$ has fairly high values for both dependent variables, and its estimated values with system GMM estimator lie between

[11] Dietrich and Wanzenried (2014) treat bank capitalization, cost to income ratio, loan loss provisions and growth in deposits as endogenous with net interest margins in their model.

[12] Recent studies find that country-level institutions such as legal institutional (Houston *et al.* 2010; Ashraf & Zheng 2015) and national culture (Zheng & Ashraf 2014; Ashraf *et al.* 2016c) influence different practices of banks. These institutions remain unchanged over fairly long time-period and also act as fixed-effects.

the values estimated with OLS and fixed-effects estimators. Therefore, I prefer system GMM and Eq. (1) is estimated with two step system GMM estimator.

To determine the endogenous bank-level variables, I follow Baum *et al.* (2003) and Baum *et al.* (2007) and use Durbin-Wu-Hausmann test. I treat Equity_TA, Deposits_TA and Cost_Income as endogenous and use their one period lag values together with the lag of dependent variable as instruments when NIM is used as dependent variable. While, Equity_TA, Deposits_TA and NII_TR are treated as endogenous and their one period lag values together with lag of dependent variable are used as instruments when GL_TA is used as dependent variable.

One concern with GMM estimators can be a large number of instruments (i.e., instrument proliferation problem) that can overfit endogenous regressors in empirical analysis (Roodman 2009). To eliminate this concern, I follow the advice of Roodman (2009) and use the collapse option for reducing the number of instruments in all estimations. Time dummies are included in all estimations because basic assumptions to apply system GMM are more likely to hold in presence of time dummies (Roodman 2009).

To examine the impact of trade and financial openness on bank risk-taking (hypotheses H-3a, H-3b and H-3c) in multivariate analysis, I specify following static linear panel model:

$$Z\_score_{i,j,t} = \alpha_i + \beta_1 Trade\_openness_{j,t} + \beta_2 Financial\_openness_{j,t} + \beta_3 (Trade * Financial)_{j,t} + \sum_{k=1}^{k} \beta_k X_{i,j,t}^{k} + \beta_4 Bank\_Concentration_{j,t} + \sum_{l=1}^{l} \beta_l X_{j,t}^{l} + \sum_{t=1}^{T-1} \epsilon_t D_t + \varepsilon_{i,j,t} \quad \text{Eq. (2)}$$

Here dependent variable, *Z_score*, measures bank risk-taking where higher values of *Z_score* represent higher bank risk-taking and vice versa. Trade_Openness and Financial_Openness capture independent, whereas interaction-term, Trade*Financial, captures the joint effect of trade and financial openness on bank risk-taking behavior. $X_{i,j,t}^{k}$ is a set of bank-level control variables including Log_TA, Growth_TA, LLP_TA and NII_TR. Other control variables are same as in Eq (1).

I use pooled and random-effects panel regression methods to estimate the Eq. (2). These models offer the advantage of taking into account cross-country as well as over-time variations in openness variables. I also tried dynamic version of Eq. (2) by including one-period lag of Z_score on right-hand side and estimating it with two step system GMM

estimator. But, AR(2) and Hansen tests were not insignificant when I use one-period lag of dependent risk variable on right-hand side of Eq. (2) and as instrument in gmm style, leaving the results of the model doubtful. However, AR(2) and Hansen tests were insignificant when I use one-period and two-period lags of Z_score on right-hand side of Eq. (2) and as instruments in gmm style, but this reduced number of useful bank observations to very low. I treat Growth_TA, LLP_TA and NII_TR as endogenous and use their one period lag values as instruments.

# 5. Empirical Results

## 5.1 Summary statistics

Table 2 reports country-level mean values of three dependent variables, NIM, GL_TA and Z_score, and two main independent variables, Trade_Openness and Financial_Openness. Consistent with Demirgüç-Kunt and Huizinga (1999), average net interest margins, NIM, are higher in Latin American countries such as Brazil, Chile, Columbia and Venezuela. As shown in Table 2, significant cross-country heterogeneity exists in average values of dependent and independent variables.

**(Insert Table 2 here)**

Table 3 reports full sample summary statistics of all variables. For dependent variables, full sample mean value of NIM is 4.32 with a standard deviation of 2.74, mean values of GL_TA is 58.57 with a standard deviation of 16.47, and mean value of Z_score is -3.45 with a standard deviation of 0.97. This summary statistics is largely comparable with related previous literature (Demirgüç-Kunt & Huizinga 1999; Laeven & Levine 2009). For main independent variables, mean value of Trade_Openness is 0.83 with a standard deviation of 0.41, and mean value of Financial_Openness is 0.67 with a standard deviation of 1.48. Other variables also show considerable variation across mean values.

**(Insert Table 3 here)**

Table 4 and Figure (1) shows yearly distribution of sample with yearly means of three dependent variables, NIM, GL_TA and Z_score, and two main independent variables, Trade_Openness and Financial_Openness. Trade_Openness has substantially increased over sample period from its lowest average value of 74 % of GDP in 2002[13] to highest average

[13] Average per year Trade_Openness for all countries is higher in 2000 and 2001 due to missing values of some countries having low Trade_Openness ratios in these years.

value of 91% of GDP in 2012. Similarly, average level of Financial_Openness increases from its low value of 0.56 in 2002 to its highest value of 0.84 in 2008, but decreases after that back to its lowest value of 0.49 in 2012. Reversal of financial openness after 2008 may be an outcome of more pressure faced by emerging countries to decelerate capital outflows due to the financial crisis in developed countries. This phenomenon is consistent with large literature which argues negative impact of higher financial openness in emerging economies (see, Kauko (2014) for detailed survey of this literature). Higher capital inflows increase risk of the domestic economy because of the higher probability that international investors pull their funds as adverse economic shocks occur (Stiglitz 2000, 2004b; Stiglitz 2004a). These variations in trade and financial openness variables validate that a suitable laboratory (sample of countries) has been chosen for analysis. Further, trade and financial openness seems to have followed a trend as shown in Figure (1). Financial openness seems to follow trade openness and variations in it are larger than the variations in trade openness. Trade openness rebounded quickly after financial crisis in 2010 but financial openness has not rebounded until the end of sample period.

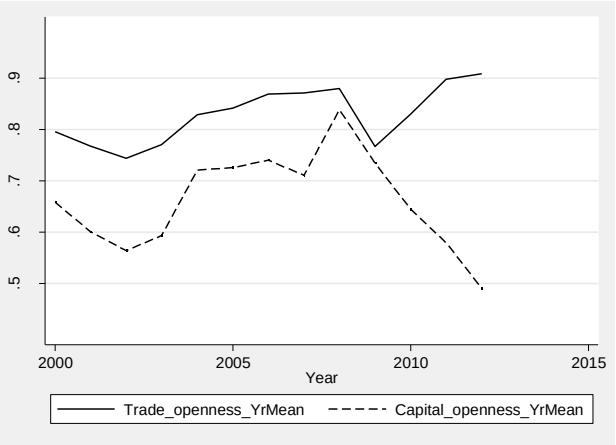


**Figure 1: Yearly trend in trade and capital openness for sample countries**

For dependent variables, bank net interest margins and risk-taking largely show a decreasing trend as NIM decreases from its highest value of 4.94 in 2000 to lowest value of 4.17 in 2012 and Z_score decreases from highest value of -3.09 to lowest value of -3.85. Whereas bank loan ratios show an increasing trend as GL_TA increases from its lowest value of 53.58 in 2000 to higher values in later years such as 61.71 in 2012.

**(Insert Table 4 here)**

Table 5 reports pair-wise Pearson correlations between main variables. As shown, correlations between most of the variables are not very strong suggesting less chances of multicollinearity in multivariate analysis.

**(Insert Table 5 here)**

After having preliminary insights from correlations and yearly trends and considering that bank net interest margins, loan ratios and the probability of default are influenced by other bank-, industry- and country-level variables in addition to the level of trade and financial openness of a country, a multivariate analysis is carried out as reported in below sub-sections 4.2, 4.3 and 4.4.

## 5.2 Openness and the cost of bank credit

To examine the impact of trade and financial openness on the cost of bank credit, I use NIM as dependent variable and estimate the different variations of Eq. (1). First I estimate baseline model excluding both openness variables and their interaction term. Next I include trade openness and financial openness variables individually and simultaneously. Finally I include both openness variables and their interaction term in same model. Results are reported in Table 6.

**(Insert Table 6 here)**

I estimate baseline model with OLS, fixed-effects and system GMM estimators. As shown from results, the estimated value for the coefficient of lagged NIM (0.655) with system GMM estimator in Model 2 lies between its estimated values with OLS estimator in Model 1 (0.772) and with fixed-effects estimator in Model 3 (0.483)[14]. The coefficients of the other variables change according to the econometric model employed, suggesting that employing OLS or FEM can lead to erroneous conclusions. Thus the system GMM estimator is a preferred model and its results are explained only.

For bank-level variables in Model 2, positive and significant coefficients of Equity_TA and Deposits_TA variables show that with improvement in capital and deposit ratios, banks earn higher net interest margins. Banks having higher capitalization and strong deposit base are considered less risky and face lower funding costs which result in overall increased margins for these banks. Negative and significant coefficient of NII_TR shows that bank net interest margins decrease as share of non-interest income increases in bank total revenues. This result suggests that efficiency in financial intermediation increases as banks diversify their income

[14] As shown in Table 6, Govt_Bank is omitted from fixed-effects model. The reason is perfect multicollinearity because Govt_Bank is dummy variable and is perfectly collinear with bank fixed-effects.

sources. Similarly, Govt_Bank dummy variable enters negative and significant showing that government-owned banks have lower net interest margins in emerging economies. These results of bank-level control variables are consistent with the findings of Dietrich and Wanzenried (2014).

For banking industry-level variable, banking industry concentration shows a positive association with net interest margins. This result confirms that large banks have higher market power and earn higher NIMs when banking industry is concentrated. This result is consistent with the findings of Demirguc-Kunt *et al.* (2004).

For country-level variables, positive and significant association of Log_GDPPC with NIM shows that banks earn higher net interest margins in higher per capita countries. Since per capita income also represents mix of opportunities available to banks and overall technology used by the banks (Demirgüç-Kunt & Huizinga 1999), the higher net interest margins are seemed to be an outcome of higher efficiency in high income emerging economies. Positive association of Inflation shows that managers of banks price the poor macro-economic conditions such as inflationary shocks and charge higher interest rates. Similarly, GDP_Growth, Market_GDP, and Rule_of_Law all show negative and significant results with NIM. Negative association of GDP_Growth suggests that managers price the risk downward in good times and charge lower rates on loans. Negative impact of stock market development indicates that developed stock market increases competition in bank credit market, consequently reducing market power and rents of key financial institutions. Lower net interest margins in better rule of law countries confirm that better institutions help in reducing financial constraints by lowering the financing costs. Positive association of Financial_Crisis dummy variable shows that banks charge higher net interest margins during depression years. This indicates that managers are more risk-averse in crisis times and demand higher rates on loans. These results are consistent with previous cross-country literature on determinants of bank net interest margins, such as Demirgüç-Kunt and Huizinga (1999)[15], Demirguc-Kunt *et al.* (2004)[16], Tan (2012)[17] and Dietrich and Wanzenried (2014)[18].

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[15] Demirgüç-Kunt and Huizinga (1999) use bank-level data of 80 countries over the period from 1988 to 1995, and OLS estimator for empirical analysis.

[16] Demirguc-Kunt *et al.* (2004) use bank-level data of 72 countries over the period from 1995 to 1999, and cross-sectional OLS estimator for empirical analysis.

[17] Tan (2012) uses bank-level data of 11 Asian Emerging countries over the period from 2002 to 2010, and OLS and panel fixed effect estimators for empirical analysis.

[18] Dietrich and Wanzenried (2014) use bank-level data of 118 countries over the period from 1998 to 2012, and system-GMM estimator for empirical analysis.

Diagnostic tests of two step system GMM estimator in Model 2 also confirm that my model has been well specified. For example, coefficient of first lag of dependent variable, L.NIM, is significant and positive with a value less than 1 and indicates persistence in net interest margins. Similarly, as maximum number of instruments (72) is quite low as compared to the number of banks (285), this indicates that my results are not biased due to large number of instruments (or there is no instrument proliferation problem). In two step system GMM, Hansen test of over-identifying restrictions tests whether the instruments are valid and as a group appear exogenous. As shown, insignificant results for Hansen statistics show that null hypothesis that instruments are not exogenous is not rejected, and confirm that instruments used are valid. AR(1) and AR(2) test first-order and second-order serial correlations, respectively, in the equation in differences. Consistent with expectation, significant statistics of AR(1) confirms first-order serial correlation in residuals, while insignificant AR(2) statistics confirms that there is no second-order serial correlation in residuals.

These results of control variables as well as diagnostic tests of system GMM in baseline model validate my model for further analysis.

Next I include openness variables in baseline model. For each specification I estimate OLS, fixed-effects and two step system GMM models. I observe that the coefficient of lagged NIM estimated with GMM estimator lies between the values estimated with OLS and fixed-effects estimators confirming the superiority of system GMM estimator. However I report the results of system GMM estimator only in Models 4 to 7 to save space. Model 4 reports results when Trade_Openness variable is included. Consistent with expectation, Trade_Openness variable enters negative and significant. This result supports hypothesis H-1a, and confirms that as trade openness increases, the cost of credit provided by the key financial institutions in emerging economies decreases. The economic significance of this result is also noteworthy; a one standard deviation change in Trade_Openness (0.41) is associated with a change in NIM of -0.099 (-0.241 *0.41) where mean value of NIM is 4.32.

Similarly, Model 5 reports results after including Financial_Openness variable in baseline model. The result of Financial_Openness variable is not significant, however. Model 6 includes both, Trade_Openness and Financial_Openness, variables simultaneously. Consistently, Trade_Openness enters negative and significant, while Financial_Openness shows insignificant results. The results of Models 5 and 6 do not support the hypothesis H-1b by suggesting that individually financial openness has no significant impact on NIMs of key banks in emerging markets.

Finally I introduce interaction term in Model 7 to estimate the joint effect of trade and financial openness on NIMs. Trade_Openness and Financial_Openness both enter negative and significant, while interaction term enters positive and significant. These results support the hypothesis H-3c that trade- and capital-flows reduce bank NIMs jointly. Positive coefficient of interaction term suggests that marginal negative impact of both openness variables on net interest margins is positive. That is, for a given level of trade openness, opening up the capital account will reduce the bank net interest margins further. Similarly, for a given level of financial openness, increasing the trade openness will reduce the net interest margins further. To examine the marginal effects, I calculated derivatives of both openness variables with respect to net interest margins. To calculate the derivative of each openness variable, I used the mean value of the other openness variable as the reference. I observed that the derivative of NIM with respect to Trade_Openness at the mean level of Financial_Openness is −0.49. Similarly, the derivative of NIM with respect to Financial_Openness at the mean level of Trade_Openness is −0.16. These derivative values suggest that the marginal negative effect on net interest margins is higher for trade openness while it is lower for financial openness. Since the marginal effects of both openness variables are negative, I can conclude that the opening up a country to both trade and capital flows will have a larger impact on NIMs of key banks.

In sum, above results support that trade openness is effective in reducing the cost of bank credit. However, financial openness is effective in reducing the cost of bank credit when considered jointly with trade openness but not individually and the effect of trade and financial openness is highest on the cost of bank credit when both are considered jointly.

Overall these findings are more consistent with the sequencing openness theory which argues that trade openness is a prerequisite for financial openness (McKinnon 1993; Chinn & Ito 2006). Findings provide support to joint openness theory, which argues that simultaneous opening of both trade and financial flows is necessary (Rajan & Zingales 2003; Baltagi *et al.* 2009), to the extent that opening up a country financially when it is already open to trade will increase benefits of openness for banking sector development.

## 5.3 Openness and the volume of bank credit

To examine the impact of trade and financial openness on the volume of credit provided by the banks, I use GL_TA as dependent variable and estimate different variations of Eq. (1) using the same routine as was done in Sub-section 5.2. The results are reported in Table 7.

**(Insert Table 7 here)**

I estimate baseline model with OLS, fixed-effects and system GMM estimators and choose system GMM estimator because the estimated value for the coefficient of lagged GL_TA (0.830) with system GMM estimator in Model 2 lies between its estimated values with OLS estimator in Model 1 (0.880) and with fixed-effects estimator in Model 3 (0.626).

For bank-level control variables in Model 2, negative association of Equity_TA variable with gross loan ratios shows that with improvement in bank capitalization, banks allocate less assets to loans. This result seems an outcome of the stringent risk-based capital requirements that require banks to increase capital. One option to increase capitalization is to decrease bank credit risk. This result is consistent with Cole and Turk (2013). Negative and significant results of Log_TA and NII_TA show that an increase in bank size and non-interest income causes a reduction in assets allocated to loans. These results indicate that banks diversify income sources in lending and non-lending activities, and these effects become larger as the bank size increases. Similarly, negative association of Deposits_TA with gross loan ratios indicates that with increase in deposit ratios banks allocate less assets to loans. As higher deposit base also indicates higher bank franchise value, this result suggests the banks reduce credit risk when their franchise value increases.

For banking industry-level control variable, Bank_Concentration enters negative and significant suggesting that key banks decrease loan ratios as industry concentration increases. This result confirms that on average higher market power of key banks is related with lower loan ratios and validates my sample selection argument that key banks in competitive banking sectors will have higher loan ratios.

For country-level variables, the positive association of Log_GDPPC with GL_TA is consistent with the findings of Cole and Turk (2013). This result confirms that the demand for bank loans is higher in high income emerging economies and consequently banks on average allocate more assets to loans in these countries. Similarly, the positive association of GDP_Growth confirms that the higher economic growth stimulates the demand for bank credit and, consequently, the banks allocate more assets to loans. This result is consistent with the studies such as Aysan *et al.* (2010) [19] and Guo and Stepanyan (2011) [20] who argue that higher economic growth rates translate into higher credit demand by both the households and firms, and find positive association between GDP growth rates and bank credit growth. On the other hand, negative and significant coefficient of Inflation suggests that during inflationary

[19] Aysan *et al.* (2010) find positive association between growth rates and credit growth for Turkey.

[20] Guo and Stepanyan (2011) find positive association between growth rates and credit growth for 38 emerging markets.

periods banks become risk-averse and allocate less assets to loans. Another possible reason behind lower loan ratios in inflationary periods can be lower demand of bank loans due to worse economic conditions. Negative coefficient of Market_GDP suggests some substitution from relation based bank loans to market prices based financial market financing as the stock markets develop in a country, however this effect is not significant. Positive and significant association of Rule_of_Law shows that with improvement in law and order conditions, banks allocate more assets to loans. This result is consistent with the law and finance literature which argues that better law enforcement increases financial development (La Porta *et al.* 1997; Djankov *et al.* 2007).

Diagnostic tests of two step system GMM also confirm that the model has been well specified. For example, coefficient of lagged loan ratios, L.GL_TA, is positively significant with a value less than 1 and indicates persistence in gross loan ratios. Instrument count (73) is quite low as compared to the number of banks (285) showing that the instruments proliferation problem is not affecting results. Hansen test is insignificant showing instrument set is valid and exogenous. Significant result of AR(1) confirms first-order serial correlation in residuals, while insignificant AR(2) statistics confirms that there is no second-order serial correlation in residuals.

These results of control variables as well as diagnostic tests of system GMM in baseline model validate the model for further analysis.

Next I include openness variables in baseline model. I estimate OLS, fixed-effects and two step system GMM models to confirm that the coefficient of lagged GL_TA estimated with GMM estimator lies between the values estimated with OLS and fixed-effects estimators. Again the results confirm the superiority of system GMM estimator and I report results of system GMM estimator only in Models 4 to 7 to save space. Consistent with the expectation, Trade_Openness variable enters positive with 1% level of significance in Model 4. This positive result supports hypothesis H-2a suggesting that higher trade openness increases the volume of bank credit. The economic significance of the result is also noteworthy; a one standard deviation change in Trade_Openness (0.41) is associated with a change in GL_TA of 0.36 (0.866*0.41) where mean value of GL_TA is 58.57.

Next I include Financial_Openness variable in baseline model. As shown in Model 5, the negative and significant coefficient of Financial_Openness suggests that higher financial openness causes a decrease in the volume of bank credit in emerging economies. This negative result is opposite to the prediction (i.e., hypothesis H-2b) that higher financial openness increases bank lending. Economic significance of the result is also noticeable; one standard

deviation change in Financial_Openness (1.48) is associated with a change in GL_TA of -0.57 (-0.388*1.48) where mean value of GL_TA is 58.57. Negative impact of higher financial openness on bank lending may be due to the substitution of foreign cheap capital with costly bank loans. Since financial openness increases financial inflows in emerging economies (Reinhardt *et al.* 2013), the cost of capital decreases and net investments increase (Moore 2014). Therefore, the borrowers are likely to prefer the low cost external financing over the high cost domestic bank loans. Consistent with this argument, some recent studies have found that financially dependent industries use higher external finance and, as a result, grow at higher rates (Eichengreen *et al.* 2011) and increase exports more (Gur 2013) at higher levels of financial openness. However, this substitution will not occur if domestic banks are efficient enough to withstand in international competition and are able to extend loans at lower cost than the foreign capital. But unfortunately, the banking sectors in most of the emerging economies are not that competitive as compare to the financial systems of developed economies to which they usually compete after financial openness (Stiglitz 2000, 2004b; Stiglitz 2004a). This also supports to the recent literature which argues that before the opening up a country to international financial flows, a sufficiently developed financial system (Eichengreen *et al.* 2011) and perfect competition in credit market (Balmaceda *et al.* 2014) should be in place.

In Model 6, I include both, Trade_Openness and Financial_Openness, variables simultaneously. Results remain same; Trade_Openness enters positive and significant, while Financial_Openness enters negative and significant. Model 7 introduces interaction term to estimate the joint effect of Trade_Openness and Financial_Openness on GL_TA. Both openness variables keep their individual significances, while the interaction term, Trade*Financial, enters with highly insignificant coefficient. These results suggest that both openness variables affect bank lending significantly, but independent of each other.

In sum, above findings support that higher trade openness promotes banks' development by increasing the volume of the credit extended by the banks. Whereas, the findings do not support that higher financial openness is effective in increasing the volume of bank credit. Contrary, the findings show that the volume of bank credit decreases at the higher levels of financial openness.

## 5.4 Openness and bank risk-taking

To examine the impact of trade and financial openness on bank risk-taking, different variations of Eq. (2) are estimated using pooled panel ordinary least square estimator and panel

random-effects estimator. I also specify dynamic version of Eq. (2) and estimate it with two step system GMM estimator for robustness tests.

Table 8 reports results when Eq. (2) is estimated with pooled panel ordinary least square estimator. Model 1 is a baseline model excluding openness variables. Dependent variable is Z_score where higher values represent higher bank risk-taking and vice versa. For bank-level control variables, negative and significant coefficient on Log_TA shows that larger banks in general have lower probability of default. Positive and significant coefficients of LLP_TA and NII_TR variables show that the banks having higher loan loss provisions and higher share of non-interest incomes in total revenues, respectively, are more risky. These results are largely consistent with the findings of previous studies (Houston *et al.* 2010; Ashraf *et al.* 2016a; Ashraf *et al.* 2016c).

**(Insert Table 8 here)**

For country-level controls, positive and significant coefficients of GDP_Growth and Inflation show that bank risk-taking is higher in growing and inflationary economies. These results are also consistent with the literature survey of Kauko (2014) who suggest that higher GDP growth rates and higher inflation lead to higher bank risk in emerging economies. Higher GDP growth drives higher levels of speculative bank lending which is more likely to increase bank risk. This effect would be even more serious if banks fund this lending by large external short-term debts (Reinhart & Rogoff 2009). Negative and significant coefficient of Rule_of_Law variable indicates that banks insolvency risk is lower in better rule of law countries. One reason for this low risk may be higher loan recoveries in better law enforcement countries due to the fear of sure penalties if any of the contractual parties breach contracts. Positive and significant coefficient of Financial_Crisis dummy variable shows that the probability of bank default increases in crisis periods. These results are largely consistent with the expectation and previous literature, and validate the model for further analysis.

Next I include openness variables in baseline model. Trade_Openness enters negative and significant in Model 2. This negative result is consistent with the hypothesis H-3a and indicates that higher trade openness results in lower bank risk-taking. This result suggests that international trade provides risk diversification opportunities to banks (i.e., diversification-stability effect). The economic significance of result is also noteworthy; one standard deviation change in Trade_Openness (0.41) is associated with a change in Z_score of -0.081 (-0.198*0.41) where mean value of Z_score is -3.45.

Financial_Openness variable enters positive and significant (at 5% level) in Model 3 suggesting that higher financial openness is associated with higher bank risk-taking. This positive result is opposite to the prediction in hypothesis H-3b. This finding suggests that the higher competition in deposits and credit markets and the higher volatility caused by the higher financial openness increase bank risk-taking. This result is consistent with macro-level literature which suggests that higher financial integration in world capital markets results in repeated banking crises (Daniel & Jones 2007) and higher systemic financial risks (Jutasompakorn *et al.* 2014). Model 4 includes both, Trade_Openness and Financial_Openness, variables simultaneously. Consistently, Trade_Openness enters negative and significant, whereas Financial_Openness enters positive and significant. This result suggests that both trade and financial openness affect bank risk-taking independently. Model 5 introduces interaction term to estimate the joint effect of Trade_Openness and Financial_Openness on bank risk-taking. Trade*Financial enters highly insignificant suggesting that both openness variables affect bank risk-taking independent of each other.

Overall, these results suggest that trade openness has negative, while financial openness has positive impact on bank risk-taking in emerging economies. Further, the effects of both openness variables on bank risk-taking are independent of each other.

Next I use panel random effects estimator to further confirm above results. As shown in Table 9, the results for openness variables remain same; that is, trade openness has significantly negative, while financial openness has significantly positive impact on bank risk-taking. Results of control variables also remain same, mostly with better significance levels than the pooled panel OLS results.

As another robustness test, I estimate dynamic version of Eq. (2) using two step system GMM estimator to confirm that the results reported in Table 8 are not biased due to persistence in bank risk-taking, bank fixed-effects and endogenous variables. As explained in Section 4, I introduce two period lags of Z_score on right-hand side of Eq. (2). Results are reported in Table 10. All results qualitatively remain same, but significance levels decrease for almost all variables as compared to pooled panel OLS results. For variables of interest, Trade_Openness enters negative and significant, while coefficient of Financial_Openness although enters positive but it loses significance. There may be two reasons of this insignificant result in this model. First, the use of two-period lags of Z_score on right-hand side has reduced the number of useful bank observations to the large extent; Results of pooled and random-effects models are based on 2,693 bank observations, while this number reduces to 2,123 useful observations in system GMM model due to the use of two-period lags. Second, system GMM estimator, by

taking into account the panel fixed-effects, wipes out the some of the variation of Financial_Openness variable which is constant for many sample countries and act as panel fixed-effects. Qualitatively, these results confirm the main results that trade openness impacts bank risk-taking negatively while financial openness impacts positively, and the impact of both openness variables is independent of each other.

**(Insert Table 9 here)**

**(Insert Table 10 here)**

## 5.5 Robustness tests

I perform several robustness tests to further confirm main results: *First*, one may argue that the cost of credit is what banks earn on loans while the NIM also takes into account the interest paid to depositors in addition to the interest earned on loans. To eliminate this concern, II_AEA is used as an alternative proxy of the cost of bank credit. II_AEA equals annual interest income to total earning assets ratio for each bank. This proxy specifically measures the interest income from bank investments and, thus, captures the average cost of bank credit for borrowing firms. I use II_AEA as dependent variable in Eq. (1) and re-estimate all main specifications of Table 6. As shown in Table 11, the results improve here. Both Trade_Openness and Financial_Openness variables enter negative and significant in Models 2 to 5, while interaction terms enter insignificant in Model 5. This indicates that both types of openness decrease the cost of bank credit and this effect is independent of each other.

**(Insert Table 11 here)**

*Second*, I use NPL_GL as an alternative measure of bank risk-taking behavior. NPL_GL is annual non performing loans to gross loans ratio of each bank. Higher values of NPL_GL represent higher risk taken by a bank in financial intermediation and vice versa. I use NPL_GL as dependent variable in Eq. (2) and estimate the dynamic version of Eq. (2) by introducing one period lag of NPL_GL on right-hand side of it. For estimation, two step system GMM estimator is used and the results are reported in Table 12. As shown, Trade_Openness enters negative and significant while Financial_Openness enters positive although its coefficients are insignificant. These results are largely consistent with the results reported in Tables 8, 9 and 10.

**(Insert Table 12 here)**

*Third*, all dependent variables are measured at bank-level while both openness variables, Trade_Openness and Financial_Openness, are measured at country-level. Consequently, annual data observations of bank-level dependent variables vary from 1 to 10

(up to ten key banks from each country are included in dataset) for each yearly observation of openness variables. Due to this data structure, I estimate between-effects panel regression models as robustness tests. Between-effects panel regression estimator averages dependent and explanatory variables for estimating the effect of independent variables on dependent variable. I re-estimate all specifications of Table 6, 7 and 8 using between-effects panel regression models and report results in Table 13, 14 and 15 respectively. For between-effects panel regressions, the static version of Eq. (1) is used by eliminating one period lag from right-hand side for estimating results in Tables 13 and 14. The results observed in Table 13 using static between-effects panel regression models are consistent with the main results of Table 6. Trade_Openness enters negative and significant in all specifications while Financial_Openness enters negative and significant only jointly with Trade_Openness. Similarly the results of Table 14 for openness and bank lending are largely consistent with the results of Table 7. Trade_Openness enters positive and significant while Financial_Openness enters negative and significant in all specifications. Then Eq. (2) is estimated using between regression models for bank risk-taking. As shown the results of Table 15 are consistent with the results of Tables 8, 9 and 10 for openness and bank risk-taking behavior. Trade openness has negative while financial openness has positive association with bank risk-taking variable.

**(Insert Table 13 here)**

**(Insert Table 14 here)**

**(Insert Table 15 here)**

*Fourth*, I include additional institutional control variables in each specification of Tables 6, 7 and 8 to confirm that the results are not biased due to the omitted variables. Specifically, I include control of corruption, voice and accountability, political stability and absence of violence, and government effectiveness indices from World Governance Indicators database of World Bank (Kaufmann *et al.* 2011). Control of corruption measures the extent to which public power is exercised for private gain, including both petty and grand forms of corruption and power of elites and private interests to use state rules for self-interest. Voice and accountability measures the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media. Political stability and absence of violence measure the likelihood of destabilizing or overthrowing the government by unconstitutional or violent means and the extent of political violence and terrorism. Government effectiveness measures the quality of civil and public services and extent of independence of these services from political pressures, and quality of policy formulation and government's commitment to implementation of these

policies. I include these four governance indicators one-by-one and re-estimate all specifications of Tables 6, 7 and 8. In unreported results[21], I observe that main results hold after controlling for these institutional control variables.

## 6. Conclusion

Openness theory of financial development argues that opening up a country to both international trade and financial flows can promote financial development. Extending this theory, I examine the impact of recent rapid trade and financial openness of emerging economies on their banks' development.

Three sets of indicators of bank development are used to distinguish the cost, volume and risk of bank credit. Two alternative proxies are used to measure the cost of bank credit: annual net interest margins and annual interest income to average earning assets ratio. The volume of the credit extended by the banks to private sector is measured with annual gross loans to total assets ratios of each bank. Similarly, two alternative proxies are used to measure the risk taken by the banks in extending credit: bank z-score and annual non-performing loans to gross loans ratios.

I argue that trade and financial openness can promote banking sector development at micro level by increasing the volume and decreasing the cost and risk of bank credit. Using a panel dataset of 287 key banks from 37 emerging countries over the period 2000-2012, the results show that higher trade openness is positively associated with the volume of the credit extended by the banks to private sector and is negatively associated with the cost of bank credit and bank risk-taking behavior. These results together suggest that higher trade openness promotes banks' development by increasing the volume and decreasing the cost and risk of bank credit. I identify that these results are driven, respectively, by the higher demand for finance, the domestic financial sector liberalization reforms and the lending diversification opportunities caused by the higher trade-openness.

For the impact of financial openness, the results show that higher financial openness is negatively associated with the cost and volume of the credit extended by the banks and is positively associated with bank risk-taking. These results suggest the role of financial openness for banks' development is limited because though the intense credit market competition caused by the capital inflows in financially open countries urges the banks to cut

[21] Results are not reported to conserve space and can be requested from the author.

the cost of credit, however it also forces them to increase risk-taking despite the lower volumes of credit extended. In such a scenario, the costs associated with higher bank risk-taking might outweigh the benefits associated with lower cost of bank credit.

Overall the findings of this study support that trade openness results in a low cost (i.e., efficient), large and safe banking sector, while the role of financial openness in banking sector development is limited.

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**Table 1 Openness and banks: Variable definitions**

| Variable | Definition | Data Source |
|---|---|---|
| ***Dependent variables*** | | |
| NIM | Equals annual net interest margin of each bank. | Bankscope database |
| GL_TA | Equals annual gross loans to total assets ratio of each bank. | |
| Z_score | Equals -1*[log [(ROA + CAR)/ σ(ROA)]], where ROA and CAR are annual return on assets before loan loss provisions and annual taxes and equity to total assets ratios, respectively. σ(ROA) is the standard deviation of annual values of return on assets before loan loss provisions and taxes calculated over three years rolling window. Higher values of Z_score imply more risk. | |
| ROA | Equals annual total operating profit to total assets ratio of a bank where total operating profits are measured before deducting loan loss provisions and taxes | |
| NPL_GL | Equals annual non performing loans to gross loans ratio of a bank | |
| ***Independent openness variables*** | | |
| Trade_Openness | Equals [(imports + exports)/GDP], where imports, exports and GDP are measured annually in current US dollars. | World Development Indicators, World Bank |
| Financial_Openness | Kaopen index measuring restrictions on capital and current account transactions, the requirement for the surrender of export proceeds and the presence of multiple exchange rates. | Chinn and Ito (2006, 2008) |
| ***Independent control variables*** | | |
| (1) Bank-level | | |
| Log_TA | Equals natural logarithm of annual total assets of each bank. | Bankscope database |
| Equity_TA | Equals annual total owners' equity to total assets ratio of each bank. | |
| Deposits_TA | Equals annual customers' deposits to total assets ratio of each bank. | |
| Cost_Income | Equals annual total expenses to total revenue ratio of each banks. | |
| Growth_TA | Equals year-on-year growth rate of annual total assets of each bank. | |
| LLP_TA | Equals annual loan loss provisions to total assets ratio of each bank. | |
| NII_TR | Equals annual non-interest income to total revenue ratio of each bank. | |
| Govt_Bank | Dummy variable equals to 1 if a bank is state-owned and 0 otherwise. | |
| (2) Industry-level | | |
| Bank_Concentration | Equals annual sum of assets of three largest banks as a percentage of sum of assets of all commercial banks operating in a country in that year. | Global financial development database, World Bank |
| (3) Country-level | | |
| Log_GDPPC | Equals logarithm of annual GDP per capita (current US$) of each country. | World Development Indicators, World Bank |
| GDP_Growth | Equals year-on-year annual GDP growth rate of each country. | |
| Inflation | Equals annual percentage change in consumer prices in a country. | |
| Market_GDP | Equals annual market capitalization of listed companies to GDP ratio of each country. | |
| Rule_of_Law | Measures the extent to which agents have confidence in and abide by the rules of society, the quality of contract enforcement, the police, and the courts, and the likelihood of crime and violence. | Kaufmann *et al.* (2011) |
| Financial_Crisis | Dummy variable equals to 1 if a country is in financial crisis in a year and 0 otherwise. | Laeven and Valencia (2013) |

**Table 2 Country-wise sample distribution and descriptive statistics**

| Sr. # | Country | Banks | Obs. | NIM | GL_TA | Z_score | Trade_Openness | Financial_Openness |
|---|---|---|---|---|---|---|---|---|
| 1 | ARGENTINA | 10 | 123 | 3.55 | 48.82 | -2.39 | 0.32 | -0.68 |
| 2 | BANGLADESH | 4 | 46 | 3.56 | 69.69 | -3.24 | 0.43 | -1.18 |
| 3 | BRAZIL | 5 | 64 | 5.76 | 40.53 | -3.02 | 0.25 | -0.08 |
| 4 | BULGARIA | 10 | 119 | 4.85 | 56.75 | -3.60 | 1.20 | 1.05 |
| 5 | CHILE | 1 | 8 | 7.64 | 52.73 | -3.31 | 0.67 | 1.64 |
| 6 | CHINA | 10 | 109 | 2.53 | 57.95 | -3.69 | 0.59 | -1.18 |
| 7 | COLOMBIA | 6 | 64 | 6.46 | 63.95 | -3.07 | 0.36 | -0.22 |
| 8 | CZECH REPUBLIC | 10 | 122 | 2.32 | 48.39 | -3.68 | 1.28 | 2.17 |
| 9 | EGYPT | 10 | 128 | 2.06 | 44.00 | -2.99 | 0.52 | 1.99 |
| 10 | ESTONIA | 4 | 47 | 3.22 | 65.20 | -3.47 | 1.56 | 2.42 |
| 11 | HUNGARY | 9 | 111 | 4.20 | 67.56 | -3.53 | 1.54 | 2.08 |
| 12 | INDIA | 10 | 119 | 3.04 | 55.96 | -3.61 | 0.42 | -1.18 |
| 13 | INDONESIA | 10 | 128 | 5.43 | 49.96 | -3.24 | 0.57 | 0.92 |
| 14 | ISRAEL | 10 | 127 | 2.61 | 67.48 | -3.73 | 0.75 | 2.07 |
| 15 | LATVIA | 9 | 102 | 2.82 | 63.98 | -3.51 | 1.05 | 2.38 |
| 16 | LITHUANIA | 7 | 82 | 3.05 | 70.28 | -3.40 | 1.24 | 2.09 |
| 17 | MALAYSIA | 4 | 34 | 2.87 | 58.48 | -3.69 | 1.91 | -0.20 |
| 18 | MEXICO | 10 | 128 | 5.49 | 57.39 | -3.33 | 0.56 | 0.95 |
| 19 | MOROCCO | 6 | 69 | 3.24 | 48.62 | -4.14 | 0.72 | -1.18 |
| 20 | NIGERIA | 3 | 27 | 8.20 | 44.95 | -2.81 | 0.61 | -0.58 |
| 21 | OMAN | 5 | 65 | 4.10 | 73.80 | -4.27 | 0.90 | 2.18 |
| 22 | PAKISTAN | 10 | 96 | 4.82 | 53.47 | -3.36 | 0.33 | -1.18 |
| 23 | PERU | 8 | 102 | 7.09 | 63.47 | -3.31 | 0.46 | 2.42 |
| 24 | PHILIPPINES | 10 | 90 | 3.66 | 41.29 | -3.80 | 0.81 | -0.36 |
| 25 | POLAND | 10 | 90 | 3.18 | 61.66 | -3.85 | 0.84 | 0.05 |
| 26 | QATAR | 7 | 90 | 3.48 | 60.57 | -3.91 | 0.92 | 2.42 |
| 27 | REPUBLIC OF KOREA | 1 | 7 | 2.26 | 64.96 | -3.63 | 0.67 | -0.12 |
| 28 | ROMANIA | 9 | 108 | 6.52 | 56.36 | -3.14 | 0.77 | 1.59 |
| 29 | RUSSIA | 10 | 119 | 5.87 | 61.82 | -3.12 | 0.55 | -0.03 |
| 30 | SLOVENIA | 10 | 124 | 3.10 | 67.37 | -3.81 | 1.26 | 1.63 |
| 31 | SOUTH AFRICA | 4 | 34 | 5.90 | 74.86 | -3.99 | 0.61 | -1.18 |
| 32 | THAILAND | 10 | 130 | 2.91 | 69.10 | -3.62 | 1.36 | -0.52 |
| 33 | TURKEY | 10 | 87 | 5.15 | 54.39 | -3.44 | 0.51 | -0.47 |
| 34 | UKRAINE | 6 | 72 | 7.08 | 78.35 | -2.58 | 1.06 | -1.38 |
| 35 | UNITED ARAB EMIRATES | 10 | 124 | 3.07 | 64.91 | -4.03 | 1.27 | 2.42 |
| 36 | VENEZUELA | 8 | 98 | 11.80 | 49.70 | -2.88 | 0.51 | -0.51 |
| 37 | VIET NAM | 9 | 80 | 3.28 | 51.16 | -3.59 | 1.43 | -0.59 |
| | **Total/mean** | **287** | **3273** | **4.32** | **58.57** | **-3.45** | **0.83** | **0.67** |

***Note:*** NIM, GL_TA and Z_score represent bank net interest margins, gross loan ratios and risk, respectively. Trade_Openness equals imports plus exports to GDP ratio of a country. Financial_Openness equals Kaopen index developed by Chinn and Ito (2006, 2008).

**Table 3 Summary statistics of main variables**

| Variables | Countries | Obs. | Mean | Std. Dev. | Min | Max |
|---|---|---|---|---|---|---|
| NIM | 37 | 3,273 | 4.32 | 2.74 | -0.96 | 18.86 |
| GL_TA | 37 | 3,273 | 58.57 | 16.47 | 9.07 | 94.52 |
| Z_score | 37 | 2,790 | -3.45 | 0.97 | -7.48 | 3.94 |
| Trade_Openness | 37 | 3,273 | 0.83 | 0.41 | 0.18 | 2.20 |
| Financial_Openness | 37 | 3,273 | 0.67 | 1.48 | -1.88 | 2.42 |
| Log_TA | 37 | 3,273 | 15.70 | 1.66 | 10.89 | 20.74 |
| Equity_TA | 37 | 3,273 | 9.85 | 4.55 | 1.29 | 32.00 |
| Deposits_TA | 37 | 3,273 | 66.38 | 17.82 | 4.66 | 94.77 |
| NII_TR | 37 | 3,273 | 34.47 | 17.92 | -12.31 | 113.83 |
| LLP_TA | 37 | 3,167 | 0.82 | 1.20 | -1.40 | 8.74 |
| Cost_Income | 37 | 3,261 | 56.20 | 21.15 | 6.86 | 178.71 |
| Govt_Bank | 37 | 3,273 | 0.20 | 0.40 | 0 | 1 |
| Bank_Concentration | 37 | 3,273 | 58.53 | 16.56 | 21.84 | 100 |
| Log_GDPPC | 37 | 3,273 | 8.56 | 1.16 | 5.85 | 11.57 |
| GDP_Growth | 37 | 3,273 | 4.77 | 4.42 | -17.73 | 26.17 |
| Inflation | 37 | 3,273 | 6.48 | 6.07 | -4.87 | 55.04 |
| Market_GDP | 37 | 3,273 | 0.41 | 0.36 | 0.00 | 2.91 |
| Rule_of_Law | 37 | 3,273 | -0.04 | 0.67 | -1.69 | 1.31 |

***Note:*** This table reports summary statistics of main variables used in empirical analysis.

**Table 4 Yearly averages of openness and bank variables**

| Year | Obs. | NIM | GL_TA | Z_score | Trade_Openness | Financial_Openness |
|---|---|---|---|---|---|---|
| 2000 | 182 | 4.94 | 53.58 | . | 0.80 | 0.66 |
| 2001 | 196 | 4.66 | 53.89 | . | 0.77 | 0.60 |
| 2002 | 211 | 4.53 | 54.21 | -3.09 | 0.74 | 0.56 |
| 2003 | 220 | 4.40 | 55.45 | -3.25 | 0.77 | 0.59 |
| 2004 | 255 | 4.29 | 55.79 | -3.34 | 0.83 | 0.72 |
| 2005 | 266 | 4.21 | 56.56 | -3.36 | 0.84 | 0.73 |
| 2006 | 279 | 4.17 | 58.02 | -3.42 | 0.87 | 0.74 |
| 2007 | 282 | 4.26 | 59.88 | -3.61 | 0.87 | 0.71 |
| 2008 | 279 | 4.37 | 62.04 | -3.47 | 0.88 | 0.84 |
| 2009 | 278 | 4.28 | 61.67 | -3.39 | 0.77 | 0.73 |
| 2010 | 279 | 4.17 | 61.72 | -3.38 | 0.83 | 0.65 |
| 2011 | 275 | 4.17 | 61.89 | -3.61 | 0.90 | 0.58 |
| 2012 | 271 | 4.17 | 61.71 | -3.85 | 0.91 | 0.49 |
| **Total/mean** | **3273** | **4.32** | **58.57** | **-3.45** | **0.83** | **0.67** |

***Note:*** NIM, GL_TA and Z_score represent bank net interest margins, gross loan ratios and risk, respectively. Trade_Openness equals imports plus exports to GDP ratio of a country. Financial_Openness equals Kaopen index developed by Chinn and Ito (2006, 2008).

**Table 5 Correlations between main variables**

| | Variables | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) | (13) | (14) | (15) | (16) | (17) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **(1)** | NIM | 1.00 | | | | | | | | | | | | | | | | |
| **(2)** | GL_TA | 0.01 | 1.00 | | | | | | | | | | | | | | | |
| **(3)** | Z_score | 0.07 | -0.20 | 1.00 | | | | | | | | | | | | | | |
| **(4)** | Trade_Openness | -0.26 | 0.24 | -0.20 | 1.00 | | | | | | | | | | | | | |
| **(5)** | Financial_Openness | -0.16 | 0.14 | -0.10 | 0.37 | 1.00 | | | | | | | | | | | | |
| **(6)** | Log_TA | -0.13 | 0.04 | -0.15 | -0.17 | -0.23 | 1.00 | | | | | | | | | | | |
| **(7)** | Equity_TA | 0.34 | 0.01 | -0.16 | 0.03 | 0.09 | -0.25 | 1.00 | | | | | | | | | | |
| **(8)** | Deposits_TA | 0.01 | -0.12 | -0.03 | -0.03 | -0.04 | 0.01 | -0.25 | 1.00 | | | | | | | | | |
| **(9)** | NII_TR | -0.26 | -0.18 | 0.21 | -0.07 | 0.02 | -0.16 | 0.02 | -0.01 | 1.00 | | | | | | | | |
| **(10)** | Cost_Income | -0.03 | -0.12 | 0.32 | -0.06 | 0.00 | -0.30 | -0.18 | 0.03 | 0.28 | 1.00 | | | | | | | |
| **(11)** | Govt_Bank | -0.09 | -0.05 | 0.02 | -0.11 | -0.16 | 0.23 | -0.14 | 0.04 | -0.07 | -0.07 | 1.00 | | | | | | |
| **(12)** | Bank_Concent. | -0.05 | 0.13 | -0.07 | 0.31 | 0.40 | -0.23 | 0.02 | -0.01 | -0.03 | 0.06 | -0.26 | 1.00 | | | | | |
| **(13)** | Log_GDPPC | -0.10 | 0.27 | -0.18 | 0.34 | 0.57 | 0.11 | 0.18 | -0.17 | -0.02 | -0.12 | -0.16 | 0.31 | 1.00 | | | | |
| **(14)** | GDP_Growth | -0.02 | -0.10 | -0.03 | -0.07 | -0.09 | 0.03 | 0.02 | 0.12 | -0.02 | -0.11 | 0.06 | 0.02 | -0.09 | 1.00 | | | |
| **(15)** | Inflation | 0.44 | -0.19 | 0.21 | -0.20 | -0.30 | -0.09 | 0.14 | -0.04 | 0.01 | 0.05 | 0.03 | -0.20 | -0.18 | -0.01 | 1.00 | | |
| **(16)** | Market_GDP | -0.14 | 0.07 | -0.11 | -0.07 | -0.11 | 0.36 | -0.06 | 0.03 | -0.04 | -0.15 | 0.07 | 0.05 | 0.08 | 0.21 | -0.18 | 1.00 | |
| **(17)** | Rule_of_Law | -0.46 | 0.23 | -0.25 | 0.58 | 0.58 | -0.03 | -0.06 | -0.04 | 0.01 | -0.07 | -0.08 | 0.42 | 0.60 | -0.09 | -0.46 | 0.09 | 1.00 |

***Note:*** This table reports Pearson correlation coefficients between each pair of main variables.

**Table 6 Openness and the cost of bank credit**

| Variables | NIM | | | | | | |
|---|---|---|---|---|---|---|---|
| | OLS | Sys-GMM | Fixed-effects | Sys-GMM | Sys-GMM | Sys-GMM | Sys-GMM |
| | Model (1) | Model (2) | Model (3) | Model (4) | Model (5) | Model (6) | Model (7) |
| L.NIM | 0.772*** | 0.655*** | 0.483*** | 0.656*** | 0.650*** | 0.651*** | 0.657*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| **Trade_Openness** | | | | **-0.241**** | | **-0.261***** | **-0.317***** |
| | | | | **(0.011)** | | **(0.004)** | **(0.001)** |
| **Financial_Openness** | | | | | **-0.015** | **-0.025** | **-0.104*** |
| | | | | | **(0.665)** | **(0.475)** | **(0.075)** |
| **Trade*Financial** | | | | | | | **0.104**** |
| | | | | | | | **(0.024)** |
| Log_TA | -0.027* | 0.084 | -0.403*** | 0.052 | 0.037 | 0.010 | 0.006 |
| | (0.067) | (0.324) | (0.000) | (0.557) | (0.638) | (0.902) | (0.942) |
| Equity_TA | 0.031*** | 0.077*** | 0.050*** | 0.074*** | 0.074*** | 0.072*** | 0.072*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| Deposits_TA | 0.004*** | 0.017*** | 0.010*** | 0.017*** | 0.018*** | 0.017*** | 0.017*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| NII_TR | -0.015*** | -0.017*** | -0.038*** | -0.018*** | -0.017*** | -0.018*** | -0.018*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| Cost_Income | -0.004*** | 0.001 | -0.016*** | 0.001 | 0.001 | 0.001 | 0.001 |
| | (0.001) | (0.598) | (0.000) | (0.601) | (0.689) | (0.686) | (0.638) |
| Govt_Bank | -0.076 | -0.180** | - | -0.174** | -0.153** | -0.152** | -0.160** |
| | (0.128) | (0.021) | - | (0.018) | (0.044) | (0.032) | (0.023) |
| Bank_Concentration | 0.002 | 0.008*** | 0.000 | 0.008*** | 0.007*** | 0.007*** | 0.008*** |
| | (0.135) | (0.001) | (0.998) | (0.001) | (0.000) | (0.000) | (0.000) |
| Log_GDPPC | 0.090*** | 0.097* | -0.063 | 0.100** | 0.122** | 0.126** | 0.110** |
| | (0.000) | (0.056) | (0.574) | (0.035) | (0.038) | (0.022) | (0.040) |
| GDP_Growth | -0.025*** | -0.023*** | -0.0017** | -0.023*** | -0.023*** | -0.023*** | -0.024*** |
| | (0.000) | (0.001) | (0.038) | (0.001) | (0.001) | (0.001) | (0.001) |
| Inflation | 0.021*** | 0.035*** | 0.021*** | 0.035*** | 0.034*** | 0.033*** | 0.032*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| Market_GDP | -0.024 | -0.272* | 0.169* | -0.263* | -0.218 | -0.225* | -0.161 |
| | (0.684) | (0.073) | (0.071) | (0.073) | (0.106) | (0.084) | (0.232) |
| Rule_of_Law | -0.507*** | -0.616*** | -0.413* | -0.535*** | -0.638*** | -0.540*** | -0.563*** |
| | (0.000) | (0.000) | (0.073) | (0.000) | (0.000) | (0.000) | (0.000) |
| Financial_Crisis | -0.173** | 0.176** | -0.353*** | 0.211** | 0.167* | 0.207** | 0.180** |
| | (0.020) | (0.050) | (0.000) | (0.018) | (0.065) | (0.021) | (0.042) |
| *Year_Dummies* | *Yes* | *Yes* | *Yes* | *Yes* | *Yes* | *Yes* | *Yes* |
| Constant | 0.664** | -2.793** | 9.903*** | -2.050 | -2.164* | -1.509 | -1.294 |
| | (0.047) | (0.032) | (0.000) | (0.157) | (0.061) | (0.238) | (0.318) |
| ***Diagnostic tests*** | | | | | | | |
| AR(1) | | -8.01*** | | -7.97*** | -7.99*** | -7.95*** | -7.96*** |
| | | (0.000) | | (0.000) | (0.000) | (0.000) | (0.000) |
| AR(2) | | -0.81 | | -0.82 | -0.84 | -0.85 | -0.82 |
| | | (0.421) | | (0.421) | (0.419) | (0.419) | (0.460) |
| Hansen test | | 59.06 | | 58.32 | 58.03 | 57.03 | 55.68 |
| | | (0.122) | | (0.120) | (0.133) | (0.144) | (0.163) |
| F-test | | 275.74*** | | 277.11*** | 256.41*** | 253.58*** | 259.54*** |
| | | (0.000) | | (0.000) | (0.000) | (0.000) | (0.000) |
| No. of instruments | | 69 | | 70 | 70 | 71 | 72 |
| R-square | 0.863 | | 0.631 | | | | |
| Observations | 2,969 | 2,969 | 2,969 | 2,969 | 2,969 | 2,969 | 2,969 |
| Banks | 285 | 285 | 285 | 285 | 285 | 285 | 285 |

***Note:*** This table reports the results for individual as well as joint effects of trade and financial openness on the cost of bank credit. Dependent variable, NIM, equals annual bank net interest margins and represents the cost of bank credit. Trade_Openness, Financial_Openness, and their interaction term, Trade*Financial, are three main explanatory variables. Other bank-level and country-level variables are used as control variables. Detailed definitions of variables are given in Table 1. Model 1 is estimated using OLS estimator, Model 3 is estimated with panel fixed-effects estimator and all other Models are estimated using two step system GMM estimator. AR(1) and AR(2) are Arellano–Bond tests of first order and second order autocorrelations, respectively, between residuals. Hansen test is the test for over-identifying restrictions in two step system GMM. F-test checks model fitness. *P*-values are presented in parenthesis. ***, **,* represent statistical significance at 1%, 5%, and 10% levels, respectively.

**Table 7 Openness and the volume of bank credit (lending)**

| Variables | GL_TA | | | | | | |
|---|---|---|---|---|---|---|---|
| | OLS | Sys-GMM | Fixed-effects | Sys-GMM | Sys-GMM | Sys-GMM | Sys-GMM |
| | Model (1) | Model (2) | Model (3) | Model (4) | Model (5) | Model (6) | Model (7) |
| L.GL_TA | 0.880*** | 0.830*** | 0.626*** | 0.835*** | 0.827*** | 0.836*** | 0.832*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| **Trade_Openness** | | | | **0.866**** | | **0.913**** | **0.899**** |
| | | | | **(0.012)** | | **(0.046)** | **(0.028)** |
| **Financial_Openness** | | | | | **-0.388***** | **-0.373***** | **-0.349*** |
| | | | | | **(0.002)** | **(0.003)** | **(0.085)** |
| **Trade*Financial** | | | | | | | **-0.039** |
| | | | | | | | **(0.883)** |
| Log_TA | -0.091 | -0.392*** | -1.080*** | -0.350** | -0.494*** | -0.440** | -0.449*** |
| | (0.351) | (0.009) | (0.007) | (0.018) | (0.002) | (0.014) | (0.003) |
| Equity_TA | 0.095*** | -0.152* | -0.009 | -0.132 | -0.159* | -0.146 | -0.149 |
| | (0.004) | (0.091) | (0.855) | (0.149) | (0.087) | (0.122) | (0.101) |
| Deposits_TA | -0.012* | -0.068** | 0.012 | -0.066** | -0.067** | -0.064** | -0.065** |
| | (0.100) | (0.023) | (0.449) | (0.025) | (0.025) | (0.036) | (0.027) |
| NII_TR | -0.039*** | -0.064** | -0.055*** | -0.062** | -0.064*** | -0.062** | -0.062** |
| | (0.000) | (0.011) | (0.000) | (0.014) | (0.010) | (0.014) | (0.014) |
| Cost_Income | 0.010 | 0.001 | -0.010 | 0.004 | -0.001 | 0.003 | 0.002 |
| | (0.145) | (0.957) | (0.248) | (0.755) | (0.919) | (0.802) | (0.884) |
| Govt_Bank | 0.773** | 0.362 | - | 0.406 | 0.425 | 0.473 | 0.473 |
| | (0.018) | (0.328) | - | (0.265) | (0.256) | (0.195) | (0.211) |
| Bank_Concentration | -0.016* | -0.017* | -0.032* | -0.018* | -0.012 | -0.013 | -0.013 |
| | (0.076) | (0.083) | (0.062) | (0.054) | (0.202) | (0.162) | (0.145) |
| Log_GDPPC | 0.323* | 0.404* | 5.034*** | 0.401* | 0.656*** | 0.641*** | 0.654*** |
| | (0.054) | (0.051) | (0.000) | (0.051) | (0.003) | (0.003) | (0.003) |
| GDP_Growth | 0.057** | 0.080** | 0.053** | 0.083** | 0.076** | 0.081** | 0.080** |
| | (0.016) | (0.033) | (0.032) | (0.024) | (0.042) | (0.030) | (0.032) |
| Inflation | -0.101*** | -0.103*** | -0.178*** | -0.102*** | -0.119*** | -0.117*** | -0.117*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| Market_GDP | -0.602 | -0.228 | 1.092 | -0.145 | -0.440 | -0.323 | -0.361 |
| | (0.122) | (0.622) | (0.102) | (0.753) | (0.323) | (0.489) | (0.432) |
| Rule_of_Law | 0.401 | 0.480* | 4.575*** | 0.135 | 0.595* | 0.218 | 0.290 |
| | (0.153) | (0.087) | (0.000) | (0.699) | (0.055) | (0.716) | (0.390) |
| Financial_Crisis | 0.236 | 0.515 | -0.459 | 0.322 | 0.546 | 0.303 | 0.351 |
| | (0.633) | (0.346) | (0.429) | (0.559) | (0.317) | (0.604) | (0.524) |
| *Year_Dummies* | *Yes* | *Yes* | *Yes* | *Yes* | *Yes* | *Yes* | *Yes* |
| Constant | 8.748*** | 22.120*** | 1.327 | 20.163*** | 22.062*** | 19.407*** | 19.985*** |
| | (0.000) | (0.000) | (0.858) | (0.000) | (0.000) | (0.001) | (0.000) |
| ***Diagnostic tests*** | | | | | | | |
| AR(1) | | -9.02*** | | -9.04*** | -9.01*** | -9.04*** | -9.03*** |
| | | (0.000) | | (0.000) | (0.000) | (0.000) | (0.000) |
| AR(2) | | -0.82 | | -0.80 | -0.83 | -0.82 | -0.82 |
| | | (0.414) | | (0.421) | (0.404) | (0.412) | (0.410) |
| Hansen test | | 51.10 | | 51.10 | 51.21 | 51.23 | 51.16 |
| | | (0.215) | | (0.215) | (0.212) | (0.211) | (0.213) |
| F-test | | 178.61*** | | 184.30*** | 187.38*** | 182.90*** | 187.47*** |
| | | (0.000) | | (0.000) | (0.000) | (0.000) | (0.000) |
| No. of instruments | | 70 | | 71 | 71 | 72 | 73 |
| R-square | 0.839 | | 0.574 | | | | |
| Observations | 2,969 | 2,969 | 2,969 | 2,969 | 2,969 | 2,969 | 2,969 |
| Banks | 285 | 285 | 285 | 285 | 285 | 285 | 285 |

***Note:*** This table reports the results for individual as well as joint effects of trade and financial openness on the volume of bank credit. In all Models, dependent variable, GL_TA, equals annual gross loan ratios and represents the volume of the credit extended by the banks to private sector. Trade_Openness, Financial_Openness, and their interaction term, Trade*Financial, are three main explanatory variables. Other bank-level and country-level variables are used as control variables. Detailed definitions of variables are given in Table 1. Model 1 is estimated using OLS estimator, Model 3 is estimated with panel fixed-effects estimator and all other Models are estimated using two step system GMM estimator. AR(1) and AR(2) are Arellano–Bond tests of first order and second order autocorrelations, respectively, between residuals. Hansen test is the test for over-identifying restrictions in two step system GMM. F-test checks model fitness. *P*-values are presented in parenthesis. ***, **,* represent statistical significance at 1%, 5%, and 10% levels, respectively.

**Table 8 Openness and bank risk-taking: Pooled panel OLS**

| Variables | Z_score | | | | |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| **Trade_Openness** | | **-0.198*** ** | | **-0.195*** ** | **-0.177*** ** |
| | | **(0.000)** | | **(0.000)** | **(0.002)** |
| **Financial_Openness** | | | **0.036** ** | **0.035** ** | **0.066** ** |
| | | | **(0.034)** | **(0.042)** | **(0.035)** |
| **Trade*Financial** | | | | | **-0.039** |
| | | | | | **(0.257)** |
| Log_TA | -0.031** | -0.038*** | -0.025* | -0.031** | -0.030** |
| | (0.031) | (0.007) | (0.091) | (0.029) | (0.035) |
| Growth_TA | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 |
| | (0.276) | (0.160) | (0.231) | (0.132) | (0.137) |
| LLP_TA | 0.140*** | 0.140*** | 0.139*** | 0.138*** | 0.138*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| NII_TR | 0.010*** | 0.010*** | 0.010*** | 0.010*** | 0.010*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| Bank_Concentration | 0.002 | 0.002 | 0.001 | 0.002 | 0.002 |
| | (0.161) | (0.111) | (0.278) | (0.201) | (0.239) |
| Log_GDPPC | -0.012 | -0.019 | -0.030 | -0.036 | -0.034 |
| | (0.574) | (0.379) | (0.181) | (0.109) | (0.142) |
| GDP_Growth | 0.014** | 0.013** | 0.014** | 0.013** | 0.014** |
| | (0.014) | (0.022) | (0.013) | (0.021) | (0.020) |
| Inflation | 0.014*** | 0.014*** | 0.015*** | 0.015*** | 0.016*** |
| | (0.001) | (0.001) | (0.000) | (0.000) | (0.000) |
| Market_GDP | -0.081 | -0.100* | -0.059 | -0.078 | -0.097 |
| | (0.178) | (0.095) | (0.336) | (0.198) | (0.131) |
| Rule_of_Law | -0.309*** | -0.232*** | -0.332*** | -0.254*** | -0.242*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| Financial_Crisis | 0.314*** | 0.342*** | 0.318*** | 0.346*** | 0.352*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| Year_Dummies | Yes | Yes | Yes | Yes | Yes |
| Constant | -3.312*** | -2.990*** | -3.286*** | -2.969*** | -3.011*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| Observations | 2,693 | 2,693 | 2,693 | 2,693 | 2,693 |
| R-squared | 0.198 | 0.201 | 0.199 | 0.203 | 0.203 |

***Note:*** This table reports the results for individual as well as joint effects of trade and financial openness on bank risk-taking. In all Models, dependent variable is Z_score where higher values of Z_score represent higher bank risk-taking and vice versa. Trade_Openness, Financial_Openness, and their interaction term, Trade*Financial, are three main explanatory variables. Other bank-level and country-level variables are used as control variables. Detailed definitions of variables are given in Table 1. All Models are estimated using pooled panel OLS regressions. *P*-values are computed by the heteroskedastic-robust standard errors and are presented in parenthesis. ***, **,* represent statistical significance at 1%, 5%, and 10% levels, respectively.

**Table 9 Openness and bank risk-taking: Panel random-effects**

| Variables | Z_score | | | | |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| **Trade_Openness** | | **-0.137**** | | **-0.152**** | **-0.140**** |
| | | **(0.037)** | | **(0.015)** | **(0.044)** |
| **Financial_Openness** | | | **0.067***** | **0.069***** | **0.086**** |
| | | | **(0.003)** | **(0.002)** | **(0.047)** |
| **Trade*Financial** | | | | | **-0.020** |
| | | | | | **(0.652)** |
| Log_TA | -0.028 | -0.033* | -0.014 | -0.020 | -0.019 |
| | (0.140) | (0.081) | (0.479) | (0.317) | (0.335) |
| Growth_TA | 0.001 | 0.001 | 0.001* | 0.001* | 0.001* |
| | (0.129) | (0.111) | (0.097) | (0.080) | (0.081) |
| LLP_TA | 0.133*** | 0.133*** | 0.132*** | 0.131*** | 0.131*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| NII_TR | 0.007*** | 0.007*** | 0.007*** | 0.007*** | 0.007*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| Bank_Concentration | 0.002 | 0.002 | 0.002 | 0.002 | 0.002 |
| | (0.244) | (0.205) | (0.319) | (0.271) | (0.283) |
| Log_GDPPC | -0.014 | -0.018 | -0.046 | -0.052 | -0.051 |
| | (0.666) | (0.566) | (0.176) | (0.126) | (0.135) |
| GDP_Growth | 0.018*** | 0.018*** | 0.018*** | 0.018*** | 0.018*** |
| | (0.000) | (0.001) | (0.000) | (0.000) | (0.000) |
| Inflation | 0.010** | 0.010** | 0.011*** | 0.011*** | 0.012*** |
| | (0.024) | (0.019) | (0.010) | (0.007) | (0.006) |
| Market_GDP | -0.110* | -0.115* | -0.089 | -0.093 | -0.099 |
| | (0.099) | (0.085) | (0.187) | (0.165) | (0.147) |
| Rule_of_Law | -0.305*** | -0.261*** | -0.353*** | -0.305*** | -0.302*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| Financial_Crisis | 0.400*** | 0.411*** | 0.401*** | 0.414*** | 0.415*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| Year_Dummies | Yes | Yes | Yes | Yes | Yes |
| Constant | -3.248*** | -3.047*** | -3.232*** | -3.004*** | -3.030*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| Observations | 2,693 | 2,693 | 2,693 | 2,693 | 2,693 |
| Banks | 283 | 283 | 283 | 283 | 283 |

***Note:*** This table reports the results for individual as well as joint effects of trade and financial openness on bank risk-taking. In all Models, dependent variable is Z_score where higher values of Z_score represent higher bank risk-taking and vice versa. Trade_Openness, Financial_Openness, and their interaction term, Trade*Financial, are three main explanatory variables. Other bank-level and country-level variables are used as control variables. Detailed definitions of variables are given in Table 1. All Models are estimated using panel random-effects regressions. *P*-values are computed by the heteroskedastic-robust standard errors and are presented in parenthesis. ***, **,* represent statistical significance at 1%, 5%, and 10% levels, respectively.

**Table 10 Openness and bank risk-taking: Two step system GMM**

| Variables | Z_score | | | | |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| L.Z_score | 0.457*** | 0.460*** | 0.457*** | 0.460*** | 0.461*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| L2.Z_score | -0.096*** | -0.093*** | -0.097*** | -0.094*** | -0.094*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| **Trade_Openness** | | **-0.137**** | | **-0.136**** | **-0.141**** |
| | | **(0.023)** | | **(0.024)** | **(0.027)** |
| **Financial_Openness** | | | **0.042** | **0.036** | **0.021** |
| | | | **(0.134)** | **(0.196)** | **(0.393)** |
| **Trade*Financial** | | | | | **0.008** |
| | | | | | **(0.820)** |
| Log_TA | -0.021* | -0.027** | -0.018 | -0.024* | -0.025* |
| | (0.096) | (0.044) | (0.175) | (0.076) | (0.075) |
| Growth_TA | -0.003 | -0.003 | -0.003 | -0.003 | -0.003 |
| | (0.139) | (0.116) | (0.153) | (0.129) | (0.133) |
| LLP_TA | 0.101** | 0.105** | 0.098** | 0.103** | 0.103** |
| | (0.019) | (0.013) | (0.023) | (0.016) | (0.015) |
| NII_TR | 0.005* | 0.005* | 0.006* | 0.006* | 0.005* |
| | (0.073) | (0.083) | (0.067) | (0.076) | (0.096) |
| Bank_Concentration | -0.000 | -0.000 | -0.001 | -0.001 | -0.001 |
| | (0.673) | (0.668) | (0.517) | (0.535) | (0.558) |
| Log_GDPPC | 0.029 | 0.028 | 0.021 | 0.021 | 0.020 |
| | (0.164) | (0.171) | (0.364) | (0.352) | (0.369) |
| GDP_Growth | 0.015** | 0.014** | 0.014** | 0.014** | 0.014** |
| | (0.019) | (0.027) | (0.020) | (0.029) | (0.030) |
| Inflation | 0.008** | 0.008** | 0.009** | 0.009** | 0.009** |
| | (0.046) | (0.039) | (0.034) | (0.030) | (0.037) |
| Market_GDP | -0.109** | -0.122** | -0.098* | -0.113** | -0.109* |
| | (0.034) | (0.020) | (0.059) | (0.032) | (0.052) |
| Rule_of_Law | -0.190*** | -0.138*** | -0.200*** | -0.147*** | -0.148*** |
| | (0.000) | (0.006) | (0.000) | (0.004) | (0.003) |
| Financial_Crisis | 0.125* | 0.125* | 0.119* | 0.129* | 0.129* |
| | (0.084) | (0.083) | (0.092) | (0.074) | (0.077) |
| Year_Dummies | Yes | Yes | Yes | Yes | Yes |
| Constant | -2.318*** | -2.088*** | -2.311*** | -2.085*** | -2.059*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| ***Diagnostic tests*** | | | | | |
| AR(1) | -10.88*** | -10.87*** | -10.89*** | -10.89*** | -10.87*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| AR(2) | -0.35 | -0.45 | -0.31 | -0.41 | -0.40 |
| | (0.727) | (0.654) | (0.755) | (0.679) | (0.690) |
| Hansen test | 48.59 | 49.60 | 48.32 | 49.37 | 49.34 |
| | (0.449) | (0.409) | (0.460) | (0.418) | (0.420) |
| F-test | 55.00*** | 53.75*** | 52.76*** | 51.77*** | 49.86*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| No. of instruments | 70 | 71 | 71 | 72 | 73 |
| Observations | 2,127 | 2,127 | 2,127 | 2,127 | 2,127 |
| Banks | 282 | 282 | 282 | 282 | 282 |

***Note:*** This table reports the results for individual as well as joint effects of trade and financial openness on bank risk-taking. In all Models, dependent variable is Z_score where higher values of Z_score represent higher bank risk-taking and vice versa. Trade_Openness, Financial_Openness, and their interaction term, Trade*Financial, are three main explanatory variables. Other bank-level and country-level variables are used as control variables. Detailed definitions of variables are given in Table 1. All Models are estimated using dynamic two step system GMM estimator. AR(1) and AR(2) are Arellano–Bond tests of first order and second order autocorrelations, respectively, between residuals. Hansen test is the test for over-identifying restrictions in two step system GMM. F-test checks model fitness. *P*-values are presented in parenthesis. ***, **,* represent statistical significance at 1%, 5%, and 10% levels, respectively.

**Table 11 Robustness tests: alternative measure of the cost of bank credit**

| Variables | II_AEA | | | | |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| L.II_AEA | 0.638*** | 0.642*** | 0.638*** | 0.643*** | 0.643*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| **Trade_Openness** | | **-0.564*** ** | | **-0.563*** ** | **-0.625*** ** |
| | | **(0.001)** | | **(0.001)** | **(0.001)** |
| **Financial_Openness** | | | **-0.122** ** | **-0.133** ** | **-0.212** ** |
| | | | **(0.034)** | **(0.024)** | **(0.036)** |
| **Trade_Financial** | | | | | **0.101** |
| | | | | | **(0.211)** |
| Bank-level controls | Yes | Yes | Yes | Yes | Yes |
| Industry-level control | Yes | Yes | Yes | Yes | Yes |
| Country-level controls | Yes | Yes | Yes | Yes | Yes |
| Year_dummies | Yes | Yes | Yes | Yes | Yes |
| Constant | 2.704 | 3.641 | 2.549 | 4.441** | 4.373** |
| | (0.201) | (0.120) | (0.202) | (0.044) | (0.012) |
| ***Diagnostic tests*** | | | | | |
| AR(1) | -4.53*** | -4.54*** | -4.52*** | -4.53*** | -4.52*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| AR(2) | -0.95 | -0.95 | -0.96 | -0.95 | -0.97 |
| | (0.341) | (0.344) | (0.388) | (0.341) | (0.334) |
| Hansen test | 46.56 | 47.21 | 46.32 | 46.55 | 46.52 |
| | (0.125) | (0.117) | (0.125) | (0.123) | (0.122) |
| F-test | 506.31*** | 475.60*** | 489.79*** | 461.94*** | 3044.74*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| No. of instruments | 69 | 70 | 70 | 71 | 72 |
| Observations | 2,867 | 2,867 | 2,867 | 2,867 | 2,867 |
| Banks | 285 | 285 | 285 | 285 | 285 |

***Note:*** This table reports the results for individual as well as the joint effects of trade and financial openness on the cost of bank credit. Dependent variable, II_AEA, equals annual interest income to average earning assets ratio of each bank. Trade_Openness, Financial_Openness, and their interaction term, Trade*Financial, are three main explanatory variables. Other bank-level and country-level variables are used as control variables. Detailed definitions of variables are given in Table 1. All Models are estimated using two step system GMM estimator. AR(1) and AR(2) are Arellano–Bond tests of first order and second order autocorrelations, respectively, between residuals. Hansen test is the test for over-identifying restrictions in two step system GMM. F-test checks model fitness. *P*-values are presented in parenthesis. ***, **,* represent statistical significance at 1%, 5%, and 10% levels, respectively.

**Table 12 Robustness tests: alternative measure of bank risk-taking**

| Variables | NPL_GL | | | | |
|---|---|---|---|---|---|
| | Model (1) | Model (2) | Model (3) | Model (4) | Model (5) |
| L.NPL_GL | 0.790*** | 0.791*** | 0.790*** | 0.791*** | 0.789*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| **Trade_Openness** | | **-0.661**** | | **-0.594*** | **-0.642**** |
| | | **(0.024)** | | **(0.056)** | **(0.043)** |
| **Financial_Openness** | | | **0.170** | **0.167** | **0.353** |
| | | | **(0.355)** | **(0.362)** | **(0.235)** |
| **Trade*Financial** | | | | | **0.212** |
| | | | | | **(0.396)** |
| Bank-level controls | Yes | Yes | Yes | Yes | Yes |
| Industry-level control | Yes | Yes | Yes | Yes | Yes |
| Country-level controls | Yes | Yes | Yes | Yes | Yes |
| Year_dummies | Yes | Yes | Yes | Yes | Yes |
| Constant | 24.836*** | 26.127*** | 23.269*** | 24.319*** | 24.739*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| Diagnostic tests | | | | | |
| AR(1) | -3.67*** | -3.67*** | -3.65*** | -3.65*** | -3.65*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| AR(2) | -0.94 | -0.94 | -0.95 | -0.94 | -0.95 |
| | (0.348) | (0.349) | (0.345) | (0.345) | (0.342) |
| Hansen test | 48.15 | 47.98 | 48.41 | 48.26 | 47.72 |
| | (0.206) | (0.211) | (0.199) | (0.201) | (0.218) |
| F-test | 86.09*** | 83.48*** | 84.19*** | 83.37*** | 79.68*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| No. of instruments | 69 | 70 | 70 | 71 | 72 |
| Observations | 2,335 | 2,335 | 2,335 | 2,335 | 2,335 |
| Banks | 275 | 275 | 275 | 275 | 275 |

***Note:*** This table reports the results for individual as well as the joint effects of trade and financial openness on bank risk-taking. In all Models, dependent variable, NPL_GL, equals nonperforming loans to gross loans ratio and represents bank credit risk where higher values of NPL_GL represent higher bank credit risk and vice versa. Trade_Openness, Financial_Openness, and their interaction term, Trade*Financial, are three main explanatory variables. Other bank-level and country-level variables are used as control variables. Detailed definitions of variables are given in Table 1. All Models are estimated using two step system GMM regressions. AR(1) and AR(2) are Arellano–Bond tests of first order and second order autocorrelations, respectively, between residuals. Hansen test is the test for over-identifying restrictions in two step system GMM. F-test checks model fitness. *P*-values are presented in parenthesis. ***, **,* represent statistical significance at 1%, 5%, and 10% levels, respectively.

**Table 13 Robustness tests: between-effects panel regression models for openness and the cost of bank credit**

| Variables | NIM | | | | |
|---|---|---|---|---|---|
| | Model (1) | Model (2) | Model (3) | Model (4) | Model (5) |
| **Trade_Openness** | | **-1.015*** ** | | **-1.068*** ** | **-1.123*** ** |
| | | **(0.001)** | | **(0.000)** | **(0.000)** |
| **Financial_Openness** | | | **-0.102** | **-0.153** | **-0.332*** |
| | | | **(0.370)** | **(0.171)** | **(0.074)** |
| **Trade*Financial** | | | | | **0.453** ** |
| | | | | | **(0.026)** |
| Bank-level controls | Yes | Yes | Yes | Yes | Yes |
| Industry-level control | Yes | Yes | Yes | Yes | Yes |
| Country-level controls | Yes | Yes | Yes | Yes | Yes |
| Year_dummies | Yes | Yes | Yes | Yes | Yes |
| Constant | -3.290 | 0.523 | -3.415 | 0.536 | 1.308 |
| | (0.524) | (0.920) | (0.509) | (0.918) | (0.802) |
| Observations | 3,261 | 3,261 | 3,261 | 3,261 | 3,261 |
| R-squared | 0.654 | 0.668 | 0.655 | 0.671 | 0.673 |
| Banks | 285 | 285 | 285 | 285 | 285 |

***Note:*** This table reports the results for individual as well as joint effects of trade and financial openness on the cost of bank credit. Dependent variable, NIM, equals annual bank net interest margins and represents the cost of bank credit. Trade_Openness, Financial_Openness, and their interaction term, Trade*Financial, are three main explanatory variables. Bank-level, industry-level and country-level control variables are same as the control variables in Table 6. Detailed definitions of variables are given in Table 1. All Models are estimated using between-effects panel regression estimator. *P*-values are presented in parenthesis. ***, **,* represent statistical significance at 1%, 5%, and 10% levels, respectively.

**Table 14 Robustness tests: between-effects panel regression models for openness and the volume of bank credit**

| Variables | GL_TA | | | | |
|---|---|---|---|---|---|
| | Model (1) | Model (2) | Model (3) | Model (4) | Model (5) |
| **Trade_Openness** | | **4.352**** | | **3.802*** | **4.165**** |
| | | **(0.023)** | | **(0.072)** | **(0.045)** |
| **Financial_Openness** | | | **-2.552***** | **-2.441**** | **-2.214**** |
| | | | **(0.008)** | **(0.011)** | **(0.029)** |
| **Trade*Financial** | | | | | **-0.744** |
| | | | | | **(0.677)** |
| Bank-level controls | Yes | Yes | Yes | Yes | Yes |
| Industry-level control | Yes | Yes | Yes | Yes | Yes |
| Country-level controls | Yes | Yes | Yes | Yes | Yes |
| Year_dummies | Yes | Yes | Yes | Yes | Yes |
| Constant | 2.155 | -9.692 | -0.980 | -9.495 | -11.769 |
| | (0.961) | (0.829) | (0.982) | (0.830) | (0.792) |
| Observations | 3,261 | 3,261 | 3,261 | 3,261 | 3,261 |
| R-squared | 0.271 | 0.275 | 0.290 | 0.293 | 0.293 |
| Banks | 285 | 285 | 285 | 285 | 285 |

***Note:*** This table reports the results for individual as well as joint effects of trade and financial openness on the volume of bank credit. In all Models, dependent variable, GL_TA, equals annual gross loan ratios and represents the volume of the credit extended by the banks to private sector. Trade_Openness, Financial_Openness, and their interaction term, Trade*Financial, are three main explanatory variables. Bank-level, industry-level and country-level control variables are same as the control variables in Table 7. Detailed definitions of variables are given in Table 1. All Models are estimated using between-effects panel regression estimator. *P*-values are presented in parenthesis. ***, **,* represent statistical significance at 1%, 5%, and 10% levels, respectively.

**Table 15 Robustness tests: between-effects panel regression models for openness and bank risk-taking**

| Variables | Z_score | | | | |
|---|---|---|---|---|---|
| | Model (1) | Model (2) | Model (3) | Model (4) | Model (5) |
| **Trade_Openness** | | **-0.222**** | | **-0.228**** | **-0.215**** |
| | | **(0.024)** | | **(0.021)** | **(0.035)** |
| **Financial_Openness** | | | **0.058**** | **0.063**** | **0.052*** |
| | | | **(0.038)** | **(0.012)** | **(0.072)** |
| **Trade*Financial** | | | | | **-0.083** |
| | | | | | **(0.211)** |
| Bank-level controls | Yes | Yes | Yes | Yes | Yes |
| Industry-level control | Yes | Yes | Yes | Yes | Yes |
| Country-level controls | Yes | Yes | Yes | Yes | Yes |
| Year_dummies | Yes | Yes | Yes | Yes | Yes |
| Constant | -2.812** | -2.026 | -2.767** | -1.944 | -2.264 |
| | (0.039) | (0.145) | (0.043) | (0.164) | (0.111) |
| Observations | 2,594 | 2,594 | 2,594 | 2,594 | 2,594 |
| R-squared | 0.430 | 0.441 | 0.430 | 0.442 | 0.445 |
| Banks | 283 | 283 | 283 | 283 | 283 |

***Note:*** This table reports the results for individual as well as joint effects of trade and financial openness on bank risk-taking. In all Models, dependent variable is Z_score where higher values of Z_score represent higher bank risk-taking and vice versa. Trade_Openness, Financial_Openness, and their interaction term, Trade*Financial, are three main explanatory variables. Bank-level, industry-level and country-level control variables are same as the control variables in Table 8. Detailed definitions of variables are given in Table 1. All Models are estimated using between-effects panel regression estimator. *P*-values are presented in parenthesis. ***, **,* represent statistical significance at 1%, 5%, and 10% levels, respectively.