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Trade Openness and Bank Risk-Taking Behavior: Evidence from Emerging Economies

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Abstract: In this paper, we examine the impact of trade openness on bank risk-taking behavior. Using a panel dataset of 291 banks from 37 emerging countries over the period from 1998 to 2012, we find that higher trade openness decreases bank risk-taking. The results are robust when we use alternative bank risk-taking proxies and alternative estimation methods. We argue that trade openness provides diversification opportunities to banks in lending activities, which decrease overall bank risk. Further to this end, we observe that higher trade openness helps domestic banks to smooth out income volatility and decreases the impact of a financial crisis on banks.

Keywords: trade openness; bank risk-taking; financial crisis; Z-score

1. Introduction

The openness theory of financial development argues that the integration of a country in global goods (i.e., trade openness) and capital markets (i.e., financial openness) can promote its financial development (Rajan and Zingales 2003). According to the theory, in underdeveloped countries, the 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. 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 also generates incentives for them to support and promote financial development.

A number of studies have examined the arguments of openness theory empirically (Baltagi et al. 2009; Hauner et al. 2013; Law 2009) and largely support that higher trade and financial openness in developing countries is positively correlated with financial development. One drawback of all these studies is that they are at the macro-level and measure the financial development of a country with an aggregate bank credit to private sector to GDP ratio (i.e., annual bank credit to private sector/annual gross domestic product). What remains unclear in macro-level analysis is the impact of trade and financial openness on individual banks at the micro-level. Most important in this is how openness affects banks' risk-taking behavior. Recent literature suggests economic and financial development go hand in hand, and there is always an optimal level of bank credit to the private sector consistent with the level of economic development. Excessive bank credit to the private sector, beyond the optimal level and accompanied with lower credit standards, just accumulates higher financial sector risks (Cecchetti and Kharroubi 2012; Ductor and Grechyna 2015). Consistent with this literature, a number of recent studies have found that the likelihood that a financial crisis would

occur in a country is higher when the private credit to GDP ratio is larger (Borio and Drehmann 2009; JordÀ et al. 2013).

In this context, recent studies have examined the impact of financial openness on bank risk-taking behavior at the micro-level and find that higher financial openness increases bank risk-taking (Bourgain et al. 2012; Cubillas and González 2014). However, the studies that examine the impact of trade openness on bank risk-taking behavior are scarce. In this paper, we fill this important research gap.

There are two mainstream literature strands on the trade-openness and economic development nexus for developing countries (see, for example, Montalbano (2011) for a review of these literature strands). One strand of literature suggests that higher trade-openness provides diversification opportunities, lowers prices for consumers, improves resource allocation, and leads to more efficient production and economic growth. Contrary to this, critics argue about the destabilizing effects of trade-openness. This alternative viewpoint suggests that higher trade openness increases the exposure of the domestic economy to international business cycles, particularly to economic conditions in partner countries. Since different countries may have different economic conditions, higher trade-openness results in higher volatility in wider set of outcome variables such as aggregate consumption, income, prices, employment, and wages in a country. Following the same line of arguments, we hypothesize that trade openness may provide diversification opportunities to banks in loan markets and result in lower bank risk-taking. We also suggest an alternative hypothesis, wherein higher trade openness may expose domestic bank borrowers to internationally more volatile economic conditions and, consequently, result in higher bank risk in lending markets.

For empirical analysis, we collected a sample of bank-level data from 37 emerging countries that have experienced significant trade openness over the period from 1998 to 2012. Previewing the main results, we find robust evidence that higher trade openness is negatively associated with bank risk-taking. We also observe that higher trade openness provides banks with diversification opportunities and helps them to moderate the adverse effects of a financial crisis.

This study contributes to the existing literature in at least two ways: First, we contribute to the currently expanding literature that tries to explain the determinants of cross-country variation in bank risk-taking behavior. The extant literature has focused on the structure of the banking industry (Boyd and Nicolo 2005; Martinez-Miera and Repullo 2010), banking regulations (Ashraf et al. 2016; Haq et al. 2014; Haq and RichardHeaney 2012; Rahman et al. 2015), macroeconomic indicators such as GDP per capita, GDP growth, and inflation (Ali and Daly 2010; Bouvatier et al. 2014; Castro 2013; Chaibi and Ftiti 2015; Festić et al. 2011), the level of financial development (Vithessonthi 2014), legal institutions (Cole and Turk 2013; Houston et al. 2010), financial openness (Bourgain et al. 2012; Cubillas and González 2014), national culture (Ashraf et al. 2016), and political institutions (Ashraf 2017) as significant determinants of cross-country variation in bank risk-taking. We analyze the impact of trade openness on bank risk-taking behavior and add to this literature.

Our second important contribution is to the openness theory of financial development (Rajan and Zingales 2003; Baltagi et al. 2009; Hauner et al. 2013; Law 2009; Braun and Raddatz 2008). Rajan and Zingales (2003) argued that trade and financial openness can promote financial development by forcing developing countries to launch financial sector liberalization reforms. Some recent studies have investigated the effect of openness on financial development at the macro-level (Baltagi et al. 2009; Hauner et al. 2013; Law 2009). We contribute to this debate by examining the impact of trade openness on bank risk-taking behavior at the micro-level.

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

2. Hypotheses Development

Trade openness may have either a negative or positive impact on bank risk-taking behavior. Trade openness may have a negative impact on bank risk-taking by providing diversification opportunities.

For instance, banks in countries with higher trade openness may diversify their loan portfolio between internationally trading firms and domestic firms. Bank borrowers who sell in multiple markets with different business cycles benefit from diversification opportunities. A number of recent macro-level studies have found that the industries that are more integrated in international goods markets benefit from international diversification and are less exposed to domestic economic conditions (Braun and Raddatz 2007; Wagner 2013). Similarly, a parallel strand of micro-level literature suggests that the firms involved in international trade are more efficient and productive and have higher survival chances than the purely domestic firms (see, for example, a literature survey by Wagner (2012)). Thus, internationally trading borrowers are less likely to default on bank loans, decreasing the overall bank risk. Moreover, trade openness may also decrease bank risk by helping banks to improve credit standards. Trade openness provides access to international markets and increases the demand for financing. If all else is equal, banks would be able to pursue better collateral standards due to the higher demand for bank financing, which would decrease the chances of an adverse selection of borrowers. In this backdrop, our first hypothesis, which we refer as the 'diversification-stability effect' of trade openness, is as follows:

H-1a: *Higher trade openness decreases bank risk-taking.*

On the contrary, trade openness may have a positive impact on bank risk-taking due to higher competition and volatility. Trade openness increases demand and encourages countries to initiate financial sector liberalization reforms. Such reforms promote competition in the financial sector and force financial institutions to lower the margins on financial intermediation. Since lower margins result in lower bank profits, the banks are likely to increase average loans to compensate for reduced profits. Since, in a competitive banking sector, the banks can only extend more loans by loosening the credit standards (Bushman et al. 2014), they would accumulate more poor credit quality loans on bank balance sheets. Further, poor credit quality risks are more likely to materialize on bank balance sheets in countries with higher trade openness due to the higher income volatility and uncertainty (Newbery and Stiglitz 1984), the frequent domestic economic fluctuations (Arora and Vamvakidis 2005; Blankenau et al. 2001), and the exposure of the domestic economy to external/international shocks (Loayza and RanciÈRe 2006). Thus, our alternative hypothesis, which we refer as the 'volatility-fragility effect' of trade openness, is as follows:

H-1b: *Higher trade openness increases bank risk-taking.*

3. Data and Variables

3.1. Sample Selection

The data used in this paper is compiled from various sources; bank-level balance sheets, income statements, and accounting data are obtained from the Bankscope database provided by Bureau van Dijk Electronic Publishing, Amsterdam, The Netherlands. Data for trade openness and macroeconomic variables are obtained from the World Development Indicators (WDI) of World Bank. Data for the structure of the banking industry are downloaded from the Financial Development database of the World Bank. Data for country-level governance variables are obtained from the World Governance Indicators of Kaufmann et al. (2011). Data for financial openness are collected from Chinn and Ito (2006, 2008). Table A1 lists the variables, variable definitions, and their data sources briefly.

Since the main objective of this study is to examine the impact of trade openness on bank risk-taking, we carefully selected the countries and banks to include in our study sample.

We selected a sample of emerging economies. Christine Lagarde (the Managing Director of the International Monetary Fund, 4 February 2016) defined emerging economies as a group of around 30 to 50 countries that are in a transition phase; not too poor, not too rich, and not too closed to foreign capital, with regulatory and financial systems that have yet to fully mature. Emerging economies have

experienced rapid trade openness since the establishment of World Trade Organization in 1995 and offer a natural laboratory for our study. For example, the exports of emerging economies increased at an annual rate of 8% over the period from 2000 to 2012, while the share in the total world trade of these countries increased from 28% to 43% over the same period. Another reason that we focus only on emerging countries is that Henry (2007) suggests that including both developed and emerging countries in the same sample for examining the impact of openness on real variables can lead to misleading conclusions. Since the trade of emerging economies has been largely steady after 2012 (IMF 2015), we restrict our sample from 1998 to 2012. Different classifications are available for emerging market countries, such as the emerging markets classification by the Financial Times Stock Exchange (FTSE), London, UK; the list of emerging countries by the Banco Bilbao Vizcaya Argentaria (BBVA), Bilbao, Spain; and the emerging markets indexed in Emerging Markets Bond Index Global (EMBI Global) by J.P. Morgan, New York, NY, USA. We included 37 emerging market economies in our sample, which appear in most of these classifications. Table 1 lists the 37 countries included in the sample.

Table 1. Country-wise sample distribution.

Sr. #	Country	Banks	Observations
1	Argentina	10	114
2	Bangladesh	4	45
3	Brazil	9	123
4	Bulgaria	10	116
5	Chile	1	8
6	China	10	94
7	Colombia	6	59
8	Czech Republic	10	95
9	Egypt	10	101
10	Estonia	4	46
11	Hungary	9	96
12	India	10	92
13	Indonesia	10	124
14	Israel	10	127
15	Latvia	9	94
16	Lithuania	7	79
17	Malaysia	4	32
18	Mexico	10	126
19	Morocco	6	66
20	Nigeria	3	20
21	Oman	5	65
22	Pakistan	10	88
23	Peru	8	90
24	Philippines	10	80
25	Poland	10	80
26	Qatar	7	89
27	Republic of Korea	1	6
28	Romania	9	105
29	Russia	10	114
30	Slovenia	10	124
31	South Africa	4	30
32	Thailand	10	128
33	Turkey	10	79
34	Ukraine	6	68
35	United Arab Emirates	10	123
36	Venezuela	8	112
37	Viet Nam	9	72
	Total	**291**	**3110**

Note: This table reports the number of banks and annual bank observations for each country.

We downloaded accounting data for all active and inactive commercial, savings, and cooperative banks in the 37 sample countries over the period from 1998 to 2012 from the Bankscope database. The inclusion of inactive banks eliminates any survival bias in the data. For sample countries, the number of banks operating in different countries is different. Higher numbers of banks from some countries while the lower from others, can bias results in econometric analysis. Therefore, to get an equal representation, we included a maximum of 10 large banks from each country. Table 1 reports the number of banks and the total yearly bank observations per country.

Finally, we collected data of trade openness and other country-level control variables and linked bank-level annual data with country-level annual data. The final dataset consists of 3110 annual observations of 287 banks from 37 emerging economies over the period from 1998 to 2012.

3.2. Methodology and Variables

To examine the impact of trade openness on bank risk-taking, we specify the following panel model:

$$Y_{i,j,t} = \alpha_i + \beta_1 Trade\ Openness_{j,t} + \sum_{k=1}^{k} \beta_k X_{i,j,t}^{k} + + \sum_{l=1}^{l} \beta_l X_{j,t}^{l} + \sum_{l=1}^{l} \beta_m X_{j,t}^{m} + \sum_{t=1}^{T-1} \epsilon_t D_t + \varepsilon_{i,j,t} \quad (1)$$

where i, j, and t subscripts represent the bank, country, and year, respectively. Y is the dependent variable and represents bank risk-taking. α_i is a constant-term. *Trade Openness* is the main independent variable. $X_{i,j,t}^{k}$ is a set of bank-level control variables. $X_{j,t}^{\mathrm{l}}$ is a set of banking industry-level control variables. $X_{j,t}^{\mathrm{m}}$ is a set of country-level control variables. D_t is a dummy variable representing year fixed-effects and control for global business cycles. u_i represents the fixed effect of bank I, and $\epsilon_{i,j,t}$ is an idiosyncratic error term. We used pooled and random-effects panel regression methods to estimate Equation (1). These models offer the advantage of taking into account cross-country as well as over-time variations in openness variables.

Following the recent literature (Houston et al. 2010; Ashraf et al. 2016; Laeven and Levine 2009), we measure bank risk-taking with three alternative proxies; Z-score, σ(ROA), and σ(NIM). Z-score is calculated by $-1 \times \log[(\mathrm{ROA+CAR})/\sigma(\mathrm{ROA})]$, where ROA is equal to the annual return on assets before loan loss provisions and taxes, CAR is equal to the annual equity to total assets ratio, and σ(ROA) is equal to standard deviation of the annual values of return on assets before loan loss provisions and taxes calculated over three-year overlapping periods starting in 1998 and ending in 2012 (e.g., 1998 to 2000, 1999 to 2001, and so on). The Z-score measures the distance from the mean value by which the bank returns have to fall to deplete all shareholders' equity and thus represents the probability of bank default. Recent academic evidence shows that the Z-score defines bank risk on the domain of all real numbers and is an ideal bank risk proxy to use as dependent variable in regressions (Lepetit and Strobel 2015). σ(NIM) is the standard deviation of the annual values of the net interest margin ratio, calculated over three-year overlapping periods (i.e., 1998 to 2000, 1999 to 2001, and so on). σ(NIM) measures the volatility in bank interest income and represents the bank's risk-taking in lending activities. σ(ROA) is the standard deviation of the annual values of return on assets before loan loss provisions and taxes, also calculated over three-year overlapping periods (i.e., 1998 to 2000, 1999 to 2001, and so on). σ(ROA) measures the volatility in the bank's total operating income and represents the overall operating risk of a bank. Due to the three-year overlapping window used for calculating all three proxies of bank risk, the effective sample period for the empirical analysis starts from 2000. Further, since we use a three-year overlapping window, a bank is only included in the sample if its data is available for at least three consecutive years over the sample period.

Trade openness is the main independent variable and is measured with 'total trade to GDP ratio'. Specifically, Trade openness = (exports + imports)/GDP, where exports, imports, and GDP are all measured in annual current US dollars. Several recent studies have used 'total trade to GDP ratio' to measure trade openness (Baltagi et al. 2009; Do and A.Levchenko 2004; Huang and Temple 2005). Representing trade openness with this ratio has the advantage of clear measurement (Kim et al. 2010).

Bank level control variables include Bank Size, Bank Growth, Loan Loss Provisions, and Non Interest Income. Bank Size equals logarithm of the bank's annual total assets. Bank Growth is measured

with the year-on-year growth of the bank's total assets. Loan Loss Provisions is measured with the annual loan loss provisions to total assets ratio. Non Interest Income is measured with the annual non-interest income to total gross revenues ratio. All bank-level variables are measured at the end of the fiscal year.

Banking industry-level control variables include Industry Concentration, Capital Stringency Index, Activity Restrictions, and Explicit Deposit Insurance. The structure of the banking industry might have a significant influence on the risk-taking behavior of individual banks (Boyd and Nicolo 2005; Martinez-Miera and Repullo 2010). Therefore, we include the banking industry structure variable, Industry Concentration, in all empirical models. Industry Concentration is measured as the sum of annual assets of three largest banks as a percentage of total assets of all banks in a country. As bank failures have negative externalities and can cost huge amounts of tax-payer funds, different regulations are used to ensure bank stability. Of these, the most important are regulatory capital requirements, activity restrictions, and explicit deposit insurance. However, these regulations are heterogeneous across countries and are likely to cause variation in cross-country bank practices, including risk-taking behavior (Ashraf and Arshad 2017; Ashraf 2016; Ashraf and Zheng 2015; Zheng and Ashraf 2014; Zheng et al. 2017). We include variables in Equation (1) to control for these effects. The Capital Stringency Index measures whether risk-based minimum capital requirements are imposed on banks in a country and whether these requirements are in line with the guidelines of the Basel accords. The values of this index range from 0 to 10, where higher values indicate more stringent capital requirements in a country and vice versa. The Activity Restrictions variable represents the restrictions on banks to not participate in non-lending activities such as securities, insurance, real estate activities, or owning other firms. This index ranges from 4 to 16, where higher values indicate higher activity restrictions and vice versa. Explicit Deposit Insurance is a dummy variable and equals 1 if a country has explicit deposit insurance and 0 otherwise.

Country-level control variables include GDP Per Capita (log), GDP Growth, Inflation, Stock Market Capitalization, Rule of Law, Financial Openness, and Financial Crisis. Since macroeconomic conditions may have a strong impact on within as well as cross-country variation in bank risk-taking (Ali and Daly 2010; Bouvatier et al. 2014; Castro 2013; Chaibi and Ftiti 2015; Festić et al. 2011), we use three variables, GDP Per Capita (log), GDP Growth, and Inflation, to control for variation in macroeconomic conditions. GDP Per Capita (log) is measured as the natural logarithm of the annual gross domestic product per capita, measured in current US dollars. GDP Growth measures year-on-year percentage growth in the gross domestic product. Inflation equals the percentage change in annual average consumer prices.

Recent studies find that legal institutions have a strong influence on bank risk-taking behavior (Cole and Turk 2013; Houston et al. 2010). To control for this effect, we include the Rule of Law variable in our model. The 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.

The level of stock market development is an alternative form of financial development and can affect bank risk-taking behavior (Vithessonthi 2014). 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. The Stock Market Capitalization variable is included to control for the level of stock market development in a country. Stock Market Capitalization equals the annual market capitalization of the listed companies to GDP ratio.

Another aspect of openness is financial openness, which can affect bank risk-taking significantly (Bourgain et al. 2012; Cubillas and González 2014). We use the Kaopen index developed by Chinn and Ito (2006, 2008) to control for the level of financial openness of the sample countries. The Kaopen index measures the extent of openness in capital account transactions based on information from the IMF's Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER). Four dummy variables codify the restrictions on current account transactions, the restrictions on capital

account transactions, the presence of multiple exchange rates, and the requirement for the surrender of export proceeds. Each dummy variable takes a value equal to 1 if a particular capital account restriction is nonexistent. Chinn and Ito (2006, 2008) drive the first principle component of these four binary variables and use it as their Kaopen index. Higher values of the Kaopen index represent higher openness to cross-border capital transactions and vice versa. We rename the Kaopen index as Financial Openness for this study.

Finally, changes can occur in bank behavior during a financial crisis situation (Ashraf et al. 2016); therefore we generated a dummy variable, Financial Crisis, to include in all models. Financial Crisis equals 1 if a country is categorized as in a financial crisis situation by Laeven and Valencia (2013) financial crisis database and 0 otherwise.

4. Empirical Results

4.1. Summary Statistics

Summary statistics of main variables are reported in Table 2. The mean value of the main bank risk-taking proxy, Z-score, is −3.36, with a standard deviation of 1.05. This summary statistic of the Z-score is largely comparable with that in previous studies such as those by Kanagaretnam et al. (2014), Ashraf, Zheng and Arshad (Ashraf et al. 2016), and Ashraf (2017). For example, the mean value of the Z-score reported by Kanagaretnam, Chee Yeow and Lobo (Kanagaretnam et al. 2014) is −3.48, by Ashraf, Zheng, and Arshad (Ashraf et al. 2016) is −3.57, and by Ashraf (2017) is −3.64. The mean value of main independent variable, Trade Openness, is 0.82. This mean value suggests that the average exports plus imports to GDP ratio for the sample countries is 82%. Trade Openness has a standard deviation of 0.41, which suggests that the sample countries have large variation in their level of trade openness. Other variables also show considerable variation across mean values.

Table 2. Summary statistics of the main variables.

Variables	Countries	Observations	Mean	S.D.	Min	Max
Z-score	37	3110	−3.36	1.05	−7.48	3.05
σ(ROA)	37	3110	0.73	1.43	0.01	44.03
σ(NIM)	37	3110	0.82	1.35	0.01	22.51
Trade Openness	37	3110	0.82	0.41	0.18	2.20
Bank Size	37	3110	15.73	1.66	8.09	21.75
Bank Growth	37	3110	21.65	33.88	−93.09	835.49
Loan Loss Provisions	37	3110	0.81	1.21	−5.07	17.06
Non Interest Income	37	3110	34.02	26.29	−749.63	388.78
Capital Stringency Index	37	3110	6.68	2.05	2.00	10.00
Activity Restrictions	37	3110	10.39	2.64	5.00	16.00
Explicit Deposit Insurance	37	3110	0.77	0.42	0.00	1.00
Industry Concentration	37	3110	58.25	16.50	21.84	100.00
GDP Per Capita (log)	37	3110	8.61	1.14	5.85	11.57
GDP Growth	37	3110	4.67	4.48	−17.73	26.17
Inflation	37	3110	6.60	6.23	−4.86	55.03
Stock Market Capitalization	37	3110	0.41	0.36	0.00	2.91
Rule of Law	37	3110	−0.05	0.67	−1.69	1.31
Financial Openness	37	3110	0.66	1.47	−1.88	2.42

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

Table 3 reports pair-wise Pearson correlations between the main variables. The correlations between three bank risk-taking proxies are positive but not equal to 1.00, indicating that three proxies largely measure different aspects of bank risk. The correlations between bank risk-taking proxies and Trade Openness are negative though the correlation values are not very large. These correlations suggest a negative relationship between trade openness and bank risk taking behavior. Similarly, the correlations between most of the variables are not very strong, suggesting fewer chances of multicollinearity in multivariate analysis.

Table 3. Pearson correlations between variables.

	Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
(1)	Z-score	1.00																	
(2)	σ(ROA)	0.59	1.00																
(3)	σ(NIM)	0.50	0.66	1.00															
(4)	Trade Openness	−0.23	−0.13	−0.22	1.00														
(5)	Bank Size	−0.16	−0.16	−0.19	−0.15	1.00													
(6)	Bank Growth	0.11	0.13	0.16	**−0.01**	−0.12	1.00												
(7)	Loan Loss Provisions	0.13	0.06	0.10	**−0.03**	**−0.03**	−0.11	1.00											
(8)	Non Interest Income	0.12	0.14	**0.02**	**−0.03**	−0.09	**0.01**	**−0.01**	1.00										
(9)	Capital Stringency Index	−0.12	−0.10	−0.16	**−0.01**	0.17	−0.06	**0.03**	−0.04	1.00									
(10)	Activity Restrictions	−0.04	−0.04	**−0.02**	−0.05	0.19	**0.01**	−0.19	−0.06	0.08	1.00								
(11)	Explicit Deposit Insurance	0.15	0.10	0.16	0.07	−0.17	0.06	0.09	0.05	−0.10	−0.19	1.00							
(12)	Industry Concentration	−0.08	−0.04	−0.08	0.30	−0.22	−0.07	**0.03**	**−0.02**	−0.19	−0.08	−0.17	1.00						
(13)	GDP Per Capita (log)	−0.22	−0.13	−0.16	0.32	0.12	−0.07	**−0.02**	**0.01**	0.04	−0.19	−0.17	0.31	1.00					
(14)	GDP Growth	−0.04	**−0.02**	**−0.02**	−0.05	**0.02**	0.21	−0.40	**0.01**	−0.11	0.19	−0.18	**0.02**	−0.07	1.00				
(15)	Inflation	0.23	0.18	0.29	−0.21	−0.09	0.19	0.07	**−0.00**	0.10	0.09	0.11	−0.21	−0.18	**−0.02**	1.00			
(16)	Stock Market Capitalization	−0.13	−0.09	−0.11	−0.06	0.36	**0.01**	−0.05	**−0.03**	**−0.01**	0.07	−0.31	0.06	0.10	0.22	−0.20	1.00		
(17)	Rule of Law	−0.29	−0.21	−0.30	0.57	**−0.02**	−0.18	−0.09	**0.01**	**−0.01**	−0.08	−0.17	0.44	0.60	−0.08	−0.48	0.10	1.00	
(18)	Financial Openness	−0.13	−0.09	−0.13	0.37	−0.21	−0.11	**−0.03**	**0.02**	−0.09	−0.25	−0.12	0.41	0.57	−0.08	−0.32	−0.11	0.59	1.00

Note: This table reports the Pearson correlation coefficients between each pair of main variables. All correlations are significant at a 5% level, except those that are in bold.

After having preliminary insights from correlations and considering that bank risk-taking is influenced by other bank-, industry- and country-level variables in addition to the level of trade openness of a country, a multivariate analysis is carried out, as reported in the following sub-sections.

4.2. Openness and Bank Risk-Taking

We estimate different variations of Equation (1) to estimate the impact of trade openness on bank risk-taking behavior. We use three bank risk-taking proxies as dependent variables one by one and estimate Equation (1) using a pooled panel ordinary least square estimator and a panel random-effects estimator.

Table 4 reports the results when Equation (1) is estimated with a pooled panel ordinary least square estimator. The dependent variable is the Z-score in Model 1, σ(ROA) in Model 2, and σ(NIM) in Model 3, where higher values of all three variables represent higher bank risk-taking and vice versa. Trade Openness is the main independent variable, higher values of which represent higher trade openness and vice versa. As shown, Trade Openness is negative and significant in all three models. These results are consistent with the negative correlations observed above and suggest that higher trade openness has a strong negative impact on bank risk-taking in emerging countries. These results confirm our Hypothesis 1a and support the diversification-stability effect of trade openness for bank risk. The negative association of trade openness with the Z-score indicates that higher trade openness reduces the probability of bank default. And, the negative results of σ(NIM) and σ(ROA) suggest that higher trade openness helps banks to smooth-out the volatility in interest and total operating incomes. These results lend support to our arguments that higher trade openness provides diversification opportunities to banks.

Table 4. Impact of trade openness on bank risk-taking behavior: Pooled ordinary least square estimator.

Variables	Z-score	σ(ROA)	σ(NIM)
	Model (1)	**Model (2)**	**Model (3)**
Trade Openness	−0.325 *** (0.000)	−0.174 *** (0.002)	−0.412 *** (0.000)
Bank-level control variables			
Bank Size	−0.021 * (0.095)	−0.063 ** (0.016)	−0.090 *** (0.000)
Bank Growth	0.002 *** (0.004)	0.004 *** (0.007)	0.004 *** (0.004)
Loan Loss Provisions	0.046 ** (0.010)	0.039 ** (0.018)	0.044 ** (0.031)
Non Interest Income	0.004 ** (0.044)	0.006 ** (0.025)	0.005 ** (0.033)
Bank industry-level control variables			
Capital Stringency Index	−0.023 *** (0.009)	−0.032 ** (0.022)	−0.060 *** (0.000)
Activity Restrictions	0.010 (0.204)	0.021 (0.120)	0.034 ** (0.011)
Explicit Deposit Insurance	0.258 *** (0.000)	0.225 *** (0.000)	0.422 *** (0.000)
Industry Concentration	0.002 (0.151)	0.003 ** (0.047)	0.000 (0.985)

Table 4. *Cont.*

Variables	Z-score	σ(ROA)	σ(NIM)
	Model (1)	**Model (2)**	**Model (3)**
Country-level control variables			
GDP Per Capita (log)	0.032 (0.155)	0.077 *** (0.006)	0.120 *** (0.000)
GDP Growth	0.003 (0.539)	0.001 (0.845)	0.001 (0.881)
Inflation	0.017 *** (0.000)	0.014 ** (0.012)	0.034 *** (0.000)
Stock Market Capitalization	0.198 *** (0.002)	0.267 *** (0.000)	0.315 *** (0.000)
Rule of Law	−0.295 *** (0.000)	−0.479 *** (0.000)	−0.470 *** (0.000)
Financial Openness	0.054 *** (0.002)	0.048 * (0.060)	0.057 ** (0.048)
Financial Crisis	0.629 *** (0.000)	1.065 *** (0.000)	0.651 *** (0.001)
Year fixed-effect dummy variables	*Yes*	*Yes*	*Yes*
Constant	−2.676 *** (0.000)	1.317 ** (0.050)	1.514 *** (0.000)
Observations R-squared	3110 0.234	3110 0.196	3110 0.256

Note: This table reports the results for the impact of trade openness on bank risk-taking. The dependent variable is the Z-score in Model (1), σ(ROA) in Model (2), and σ(NIM) in Model (3), where higher values of these three variables represent higher bank risk-taking and vice versa. Trade Openness is the main explanatory variable, higher values of which represent higher trade openness. Bank-level, banking industry-level, and country-level variables are included as control variables in all models. Detailed definitions of all variables are given in Table A1. 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 the 1%, 5%, and 10% levels, respectively.

The economic significance of the results is also noteworthy. For instance, in Model 1, a one standard deviation change in Trade Openness (0.41) is associated with a change in the Z-score of −0.133 (−0.325 × 0.41), where the mean value of Z-score is −3.36. This shows that the probability of bank default decreases by 4% when trade openness increases by one standard deviation. Similarly, in Model 2, a one standard deviation change in Trade Openness (0.41) is associated with a change in σ(ROA) of −0.071 (−0.174 × 0.41), where the mean value of σ(ROA) is 0.73. This shows that the volatility in a bank's total operating income decreases by 9.7% when trade openness increases by one standard deviation. Finally, a one standard deviation change in Trade Openness (0.41) changes σ(NIM) by −0.169 (−0.412 × 0.41), where the mean value of σ(NIM) is 0.82 in Model 3. This shows that the volatility in a bank's interest income decreases by 20.6% when trade openness increases by one standard deviation. The highest economic significance of trade openness with σ(NIM) shows that trade openness provides the highest diversification in bank lending income.

The results of the control variables are also consistent with our expectations. For bank-level control variables, negative and significant coefficients of Bank Size suggest that big banks are less risky. Positive results of Loan Loss Provisions and Non Interest Income indicate that the banks with higher loan loss provisions and higher shares of non-interest incomes in total revenues, respectively, are more risky. These results are largely consistent with the findings of previous studies (Ashraf et al. 2016; Houston et al. 2010; Ashraf et al. 2016).

For banking industry-level control variables, the Capital Stringency Index is negative and significant, showing that stringent risk-based capital regulation for the banking industry results in safer individual banks. This result is consistent with recent studies that find a negative association

between capital requirements and bank risk (Ashraf et al. 2016; Rahman et al. 2015). The positive association of the Explicit Deposit Insurance dummy variable with bank risk-taking proxies shows that explicit deposit insurance generates moral hazard problems and leads banks to increase risk-taking.

For country-level controls, Inflation is positive and significant, suggesting that bank risk is higher in inflationary economies. This finding is consistent with the literature survey by Kauko (2014), who suggests that higher inflation has a positive correlation with bank risk in emerging economies. The positive and significant coefficients of Stock Market Capitalization show that bank risk-taking is higher when capital markets are more developed in a country. Developed capital markets ease the access to alternative sources of finance for borrowers and hence increase the competition in the bank lending market. The intense competition in the bank lending market forces banks to pursue risky strategies. The negative result of Rule of Law indicates that bank risk is lower in the countries with stronger rule of law. One possible reason is because the contract enforcement is better in these countries; the bank borrowers will not default on loans due to the higher likelihood of the enforcement of contractual obligations through the courts. The positive and significant coefficient of Financial Openness suggests that higher financial openness is associated with higher bank risk-taking. This result suggests that higher competition in deposits and credit markets caused by the higher financial openness increases bank risk-taking. The positive association between financial openness and bank risk-taking is consistent with the findings of recent studies (Bourgain et al. 2012; Cubillas and González 2014). The Financial Crisis dummy variable is positive with a significant coefficient, indicating that the bank income volatility and the probability of default increase in crisis periods.

Overall, the above results suggest that trade openness has a strong negative impact on bank risk in emerging economies.

4.3. Robustness Tests

We perform several robustness tests to further confirm main results. First, the structure of the dataset, used in the above empirical analysis, is in an unbalanced panel form (i.e., 291 banks, the time period is from 1998 to 2012). For such a data structure, panel random-effects or panel fixed-effects estimators can be suggested. To account for this concern, we use a panel random-effects estimator. A panel random-effects estimator is more appropriate because the main variable of interest, Trade Openness, as well as many control variables, are at the country-level and are either time-constant or have very small within-country year-on-year variation. In such cases, the use of a panel fixed-effects estimator removes the theoretical variation of interest, and it can be difficult to find a meaningful relationship between the causal and outcome variables, even if this relationship truly exists (Reeb et al. 2012). Second, a number of recent cross-country studies on bank risk-taking behavior have used a panel random-effects estimator for empirical analysis (Ashraf 2017; Ashraf et al. 2016). As shown in Table 5, the results for Trade Openness remain the same; that is, trade openness has a significantly negative impact on bank risk-taking.

Second, bank risk-taking proxies, which are dependent variables, are measured at the bank-level while Trade Openness is measured at the country-level. As a result, bank risk-taking proxies have 1 to 10 annual data observations for each yearly observation of Trade Openness. Due to this data structure, we estimate Equation (1) with a between-effects panel regression estimator. A between-effects panel regression estimator averages the dependent and explanatory variables to estimate the effect of the explanatory variables on the dependent variable. We re-estimate all specifications of Table 4 using a between-effects panel regression estimator and report the results in Table 6. As shown, the results remain the same; Trade Openness is negative and significant with all three proxies of bank risk-taking.

Table 5. Impact of trade openness on bank risk-taking calculated with a panel random-effects estimator.

Variables	Z-score	σ(ROA)	σ(NIM)
	Model (1)	**Model (2)**	**Model (3)**
Trade Openness	−0.275 *** (0.000)	−0.112 ** (0.038)	−0.203 *** (0.002)
Bank-level control variables	*Yes*	*Yes*	*Yes*
Bank industry-level control variables	*Yes*	*Yes*	*Yes*
Country-level control variables	*Yes*	*Yes*	*Yes*
Year fixed-effect dummy variables	*Yes*	*Yes*	*Yes*
Constant	−3.146 *** (0.000)	1.454 *** (0.004)	1.702 *** (0.001)
Observations	3110	3110	3110
Banks	291	291	291

Note: This table reports the results for the impact of trade openness on bank risk-taking. The dependent variable is the Z-score in Model (1), σ(ROA) in Model (2), and σ(NIM) in Model (3), where higher values of these three variables represent higher bank risk-taking and vice versa. Trade Openness is the main explanatory variable, higher values of which represent higher trade openness. Bank-level, banking industry-level, and country-level variables are included as control variables in all models. Detailed definitions of all variables are given in Table A1. 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 the 1%, 5%, and 10% levels, respectively.

Table 6. Impact of trade openness on bank risk-taking calculated with a panel between-effects estimator.

Variables	Z-score	σ(ROA)	σ(NIM)
	Model (1)	**Model (2)**	**Model (3)**
Trade Openness	−0.338 *** (0.001)	−0.294 *** (0.007)	−0.609 *** (0.000)
Bank-level control variables	*Yes*	*Yes*	*Yes*
Bank industry-level control variables	*Yes*	*Yes*	*Yes*
Country-level control variables	*Yes*	*Yes*	*Yes*
Year fixed-effect dummy variables	*Yes*	*Yes*	*Yes*
Constant	−2.070 (0.143)	0.210 (0.892)	2.398 (0.180)
Observations	3110	3110	3110
R-squared	0.494	0.438	0.540
Banks	291	291	291

Note: This table reports the results for the impact of trade openness on bank risk-taking. The dependent variable is the Z-score in Model (1), σ(ROA) in Model (2), and σ(NIM) in Model (3), where higher values of these three variables represent higher bank risk-taking and vice versa. Trade Openness is the main explanatory variable, higher values of which represent higher trade openness. Bank-level, banking industry-level, and country-level variables are included as control variables in all models. Detailed definitions of all variables are given in Table A1. All Models are estimated using panel between-effects regressions. *p*-values are computed by the heteroskedastic-robust standard errors and are presented in parenthesis. ***, **, * represent statistical significance at the 1%, 5%, and 10% levels, respectively.

4.4. Financial Crisis, Trade Openness and Bank Risk

The above results suggest that higher trade openness has a negative impact on bank risk. We argue that higher trade openness provides diversification opportunities to banks in lending activities, which decreases overall bank risk. One challenge with our above analysis is the identification that trade openness affects bank risk by providing diversification opportunities. Though it is a difficult task, the occurrence of financial crises in different countries provides us with the opportunity to examine this issue in more detail. When an adverse shock hits the financial sector, bank risks materialize, the volatility of bank returns increases, and, consequently, the probability of bank defaults increases. Such situations are often labeled financial crises. If trade openness provides diversification

opportunities, then we can expect that higher openness to trade will moderate the effects of domestic financial crisis.

To examine it empirically, we cause the trade openness and financial crisis variables to interact. For easy interpretation of the results, we convert Trade Openness into a dummy variable. We set the Trade Openness dummy variable as equal to 1 if the value of Trade Openness is above its sample median and 0 otherwise. Thus, the Trade Openness Dummy variable represents the countries that are more open to trade. The Financial Crisis variable is already a dummy variable that equals 1 if a country in a year is categorized as in financial crisis by the 'Financial Crises Database' of Laeven and Valencia (Laeven and Valencia 2013). The interaction between Trade Openness Dummy and Financial Crisis represents the countries that have above sample median trade openness and are in financial crisis.

Since our main results (as reported in Sub-Section 4.2) suggest that bank risk is lower in more open countries, we expect a negative coefficient on Trade Openness Dummy variable. Financial Crisis already is positive and significant in Table 4, showing that bank risk is higher during financial crisis. If trade openness provides diversification opportunities to banks, then higher trade openness will moderate the effect of domestic financial crisis on domestic banks, and we expect a negative coefficient on Trade Openness Dummy $\times$ Financial Crisis.

As shown in Table 7, the results are consistent with the expectation that Trade Openness Dummy is negative while Financial Crisis is positive and significant with three bank risk-taking proxies. Consistent with our expectations, the interaction term, Trade Openness Dummy $\times$ Financial Crisis, is negative and significant in Models 3, 6, and 9. These results suggest that banks have lower income volatility and, hence, default risk during a financial crisis in countries what are more open to trade.

Table 7. Impact of trade openness on bank risk during the financial crisis.

Variables	Z-score	Z-score	Z-score	σ(ROA)	σ(ROA)	σ(ROA)	σ(NIM)	σ(NIM)	σ(NIM)
	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)	Model (7)	Model (8)	Model (9)
Trade Openness Dummy	−0.341 *** (0.000)		−0.357 *** (0.000)	−0.184 *** (0.000)		−0.203 *** (0.000)	**−0.341 *** (0.000)**		**−0.344 *** (0.000)**
Financial Crisis		0.580 *** (0.000)	0.736 *** (0.000)		1.039 *** (0.000)	1.600 *** (0.000)		**0.588 *** (0.003)**	**1.191 *** (0.002)**
Trade Openness Dummy × Financial Crisis			−0.425 ** (0.040)			−1.024 ** (0.054)			**−1.280 *** (0.006)**
Bank-level control variables	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Bank industry-level control variables	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Country-level control variables	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Year fixed-effect dummy variables	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Constant	−2.605 *** (0.000)	−3.075 *** (0.000)	−2.665 *** (0.000)	1.543 ** (0.034)	1.104 * (0.097)	1.612 *** (0.007)	1.481 *** (0.000)	1.009 *** (0.006)	1.667 *** (0.000)
Observations	3110	3110	3110	3110	3110	3110	3110	3110	3110
R-squared	0.219	0.225	0.240	0.164	0.194	0.203	0.243	0.247	0.263

Note: This table reports the results for the impact of trade openness on bank risk-taking during a financial crisis period. The dependent variable is the Z-score in Models 1 to 3, σ(ROA) in Models 4 to 6, and σ(NIM) in Models 7–9, in which higher values of these three variables represent higher bank risk-taking and vice versa. Trade Openness Dummy, Financial Crisis, and Trade Openness Dummy × Financial Crisis are the main explanatory variables. Bank-level, banking industry-level, and country-level variables are included as control variables in all models. Detailed definitions of all variables are given in Table A1. 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 the 1%, 5%, and 10% levels, respectively.

5. Conclusions

In this paper, we examine the impact of trade openness on bank risk-taking behavior. Using a panel dataset of 291 banks from 37 emerging countries over the period from 1998 to 2012, we find a robust negative impact of trade openness on bank risk-taking behavior. We argue that trade openness provides diversification opportunities to banks in lending activities, which decreases overall bank risk. We confirm our results with alternative bank risk-taking proxies and with alternative estimation methods.

As an identification strategy, we use the impact of trade openness on bank risk-taking during financial crisis situations. We observe that higher trade openness provides international diversification opportunities to banks and decreases the impact of domestic financial crisis on bank risk.

Overall the findings of this study support that trade openness helps in ensuring the financial stability and are consistent with the study of Ashraf (2017), who reports that trade openness is a robust predictor of bank development in emerging markets. Future research may differentiate between bank loans to internationally trading firms and purely domestic firms to examine the bank risk-taking. Specifically, it can be examined which type of firms are more likely to default on bank loans. Another area for future research is the way in which trade openness is measured. We use an exports plus imports to GDP ratio to measure trade openness. This is considered a *de jure* measure. Trade openness can be measured with *de facto* measures such as the decrease in average tariffs or country-specific trade liberalization reforms.

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Conflicts of Interest: The authors declare no conflict of interest.

Appendix A

Table A1. Variable definitions and data sources.

Variable	Definition	Data Source
Dependent variables		
Z-score	Equals $-1 \times$ [log [(ROA + CAR)/σ(ROA)]], where ROA and CAR are the annual return on assets before loan loss provisions and the annual taxes, and equity to total assets ratios, respectively. σ(ROA) is the standard deviation of the annual values of the return on assets before loan loss provisions and taxes calculated over a three year rolling window. Higher values of the Z-score imply more risk.	Authors' calculations
σ(ROA)	Equals the standard deviation of annual values of the return on assets before loan loss provisions and taxes, calculated over a three year rolling window.	
σ(NIM)	Equals the standard deviation of the annual values of net interest margins, calculated over a three year rolling window.	
Independent openness variable		
Trade Openness	Equals [(imports + exports)/GDP], where imports, exports, and GDP are measured annually in current US dollars.	World Development Indicators, World Bank

Table A1. *Cont.*

Variable	Definition	Data Source
Independent control variables		
Bank-level		
Bank Size	Equals the natural logarithm of the annual total assets of each bank.	Bankscope database
Bank Growth	Equals the year-on-year growth rate of the annual total assets of each bank.	
Loan Loss Provisions	Equals the annual loan loss provisions to total assets ratio of each bank.	
Non Interest Income	Equals the annual non-interest income to total revenue ratio of each bank.	
Industry-level		
Industry Concentration	Equals the sum of the annual assets of the three largest banks as a percentage of the sum of the annual assets of all commercial banks operating in a country in that year.	Global financial development database, World Bank
Capital Stringency Index	The capital stringency variable measures whether regulatory capital requirements for banks in a country are in line with the Basel accords. The index ranges from 0 to 10, where higher values indicate more stringent capital requirements for banks in a country.	Barth et al. (2013)
Activity Restrictions	This variable reflects the extent to which banks in a country are restricted to participate in securities, insurance, real estate activities, or owning other firms. The variable ranges from 4 to 16, wherein higher values indicate higher restrictiveness.	
Explicit Deposit Insurance	The dummy variable equals 1 if a country has explicit deposit insurance and 0 otherwise.	
Country-level		
GDP Per Capita (log)	Equals the logarithm of the annual GDP per capita (current US$) of each country.	World Development Indicators, World Bank
GDP Growth	Equals the year-on-year annual GDP growth rate of each country.	
Inflation	Equals the annual percentage change in consumer prices in a country.	
Stock Market Capitalization	Equals the annual market capitalization of the 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, Kraay and Mastruzzi (Kaufmann et al. 2011)
Financial Openness	The 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)
Financial Crisis	The dummy variable equals 1 if a country is in financial crisis in a year and 0 otherwise.	Laeven and Valencia (2013)

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