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Openness, Financial Structure and Bank Risk: International Evidence*

By **Ma Yong and Yao Chi***

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Abstract

Using panel data from a large cross-country sample covering 97 countries over the period 1996–2017, we combine 2SLS procedure with system GMM estimation to study the relationship between openness, financial structure and bank risk. The main contribution of the paper is that we identified a new channel, i.e. the financial structure channel, through which financial openness reduces bank risk. In particular, we find that as financial openness increases, a country's financial system tends to be more market-based, and a more market-based financial system is associated with higher bank market power, better information sharing and more revenue diversification, all of which contribute to the reduction in bank risk. we also find that the effect of inflow restrictions on bank risk is more pronounced than that of outflow restrictions. These results highlight the importance of an appropriate design of a country's opening-up strategy to match the evolution of its financial structure to increase bank stability.

JEL Classification: F36, G21, G28
Keywords: Openness, Financial structure, Bank risk

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1. Introduction

The past three decades have witnessed a notable increase in openness in most economies (see Fig. 1), which was accompanied by an evolution of the financial system moving toward a more market-based financial structure (see Fig. 2). At the same time, the frequently happened incidents of banking crises, especially the 2008 global financial crisis, had reignited the thinking of the roles of financial opening-up and financial system evolution in bank risk. Moreover, as one can reasonably imagine, because financial openness and financial structure are both part of the entire picture of the financial system evolution, exploring the relationship between openness, financial structure and bank risk also involves the consideration of the endogenous relationship between financial openness and financial structure. For one thing, financial openness can foster the development of domestic stock market and banking system as well as influence the substitution or complementary relationship between banks and stock markets, and thus affect the evolution of financial structure (e.g., Levine & Zervos, 1998; Baltagi et al., 2009; Cheng, 2012). For another, the evolution of financial structure also affects bank performance such as profitability and instability (e.g., Demirgüç-Kunt & Huizinga, 2000; Stulz, 2001; Song & Thakor, 2010; Qin and Zhou, 2019).

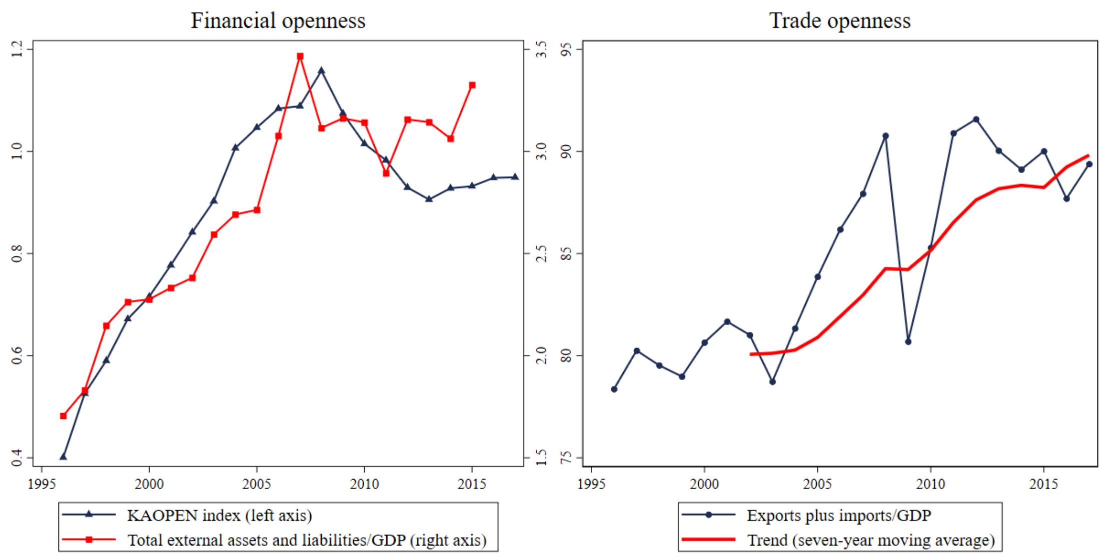

Fig. 1 The evolutions of financial openness and trade openness.

Notes: This figure presents the evolutions of financial openness and trade openness over the period 1996–2017, using data average of the 97 sample countries. The *KAOPEN* index is a *de jure* measure of financial openness with a larger value indicating a higher degree of financial openness. The ratio of total external assets and liabilities to GDP is a *de facto* measure of financial openness, also with a larger value indicating a higher degree of financial openness. Trade openness is measured by the percentage of exports plus imports to GDP (with a larger value indicating a higher degree of trade openness.), and the trend value is calculated as the seven-year moving average of trade openness.

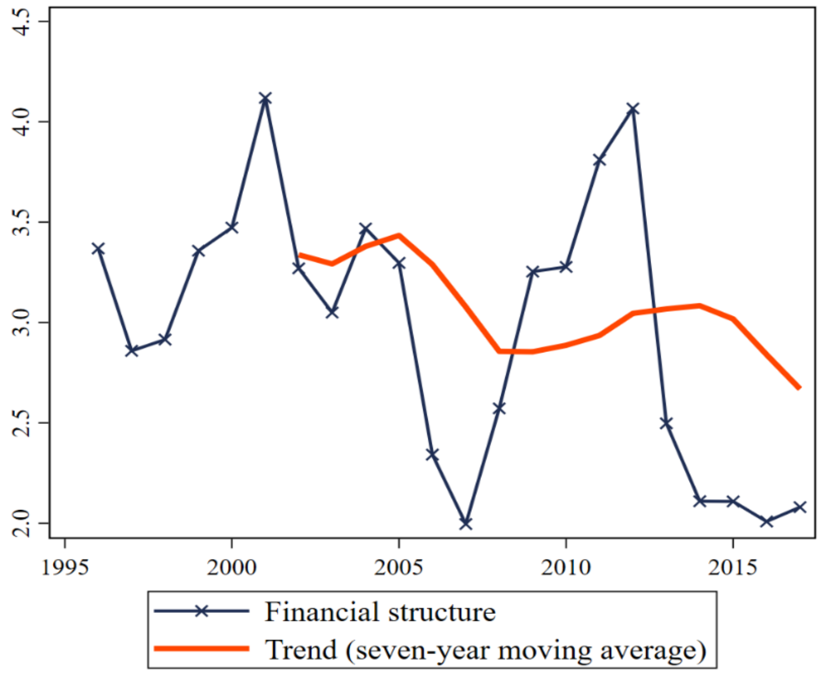

Fig. 2 The evolution of financial structure.

Notes: This figure presents the evolution of financial structure over the period 1996–2017, using data average of the 97 sample countries. The financial structure is measured by the ratio of private credit by deposit money banks to stock market capitalization, with a smaller value indicating a more market-based financial system. The trend is calculated as the seven-year moving average of financial structure.

Meanwhile, despite the extensive literature on the relationship between openness and bank stability, whether and how openness may affect bank stability is far from being conclusive up to the present, and the underlying channels are still waiting to be better understood. Up to the present, most studies focus predominantly on the "competition hypothesis" and the "diversification hypothesis" (e.g., Repullo, 2004; Gulamhussen et al., 2014; Cubillas & González, 2014; Berger et al., 2017). However, the contradictory findings in these studies indicate that these two channels cannot entirely explain how financial openness affects bank risk. More importantly, although financial openness can influence bank risk directly through these channels, it can also indirectly affect bank risk via the financial structure channel, as shown in Figure 3.

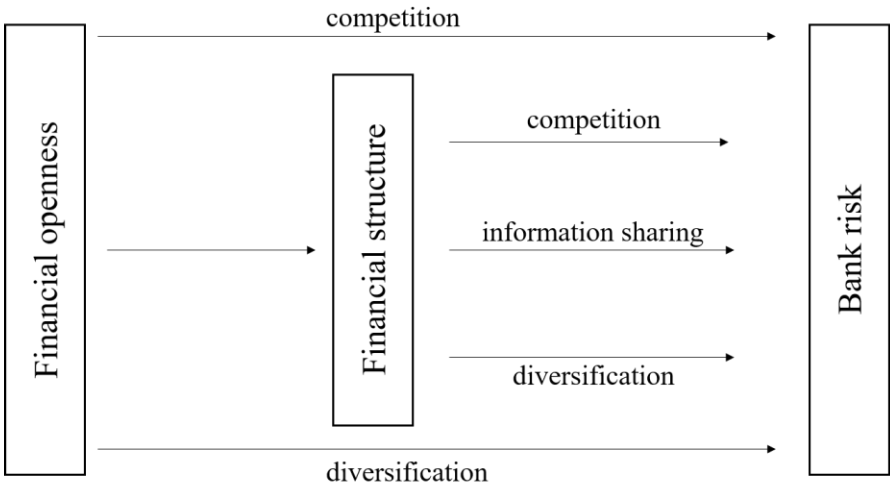

Fig. 3 The channels through which financial openness affects bank risk.

Notes: This figure provides an intuitive illustration for the underlying channels through which financial openness affects bank risk, in which we highlight a new role played by financial structure.

Having these considerations in mind, in this paper we aim to shed new light on the relationship between financial openness and bank risk by highlighting a new role played by financial structure. To do so, this paper adopts a new empirical strategy to study the effects of openness on bank risk, with a particular focus on the role of financial structure as a potential transmission channel. Based on robust results from a large panel dataset of 97 countries over the period 1996–2017, the main contributions of this paper can be summarized as follows:

First, to the best of our knowledge, this paper is the first to separate and identify the financial structure channel of openness on bank risk from other alternative channels. In particular, we set up a model of two simultaneous equations and combine 2SLS procedure with GMM estimation to examine this issue, which controls for the potential endogeneity problem arising from reverse causality between financial structure and bank risk as well as their potential simultaneous dependence on openness. We find robust evidences that while the overall effect of financial openness on bank stability is negative, financial openness can also reduce bank risk through its impact on financial structure.

Second, our paper also extends the literature by further examining the transmission channels through which financial structure affects bank risk. To do this, we conduct an ARDL model and employ Granger causality test to identify the potential transmission channels. The results show that: (1) a more market-based financial system is in general associated with higher bank market power in banking system, which in turn lead to an enhancement of bank stability; (2) a more market-based financial system is associated with better information sharing about companies, which alleviates information asymmetry and allows banks to monitor borrowers more easily and therefore improving bank stability by reducing adverse selection and moral hazard; (3) a more market-based financial system with a well-developed financial market provides more diversification opportunities, which allows banks to reduce risks by better diversifying their portfolios.

Third, our paper is perhaps among the few of its kind to explore the possible differences between inflow and outflow restrictions in the effect of financial openness on bank risk, especially the differences associated with the financial structure channel. In particular, we find that the effect of inflow restrictions on bank risk is more significant and quantitatively larger than that of outflow restrictions, no matter in terms of overall effect or the marginal effect associated with the financial structure channel.

The rest of the paper is structured as follows. Section 2 reviews the literature. Section 3 explains the research design and data. Section 4 reports and analyzes the empirical results. Section 5 concludes and provides some policy implications.

2. Literature review

A number of literatures has examined the impact of openness on financial stability both theoretically (Cordella & Yeyati, 2002; Daniel & Jones, 2007; Broner & Ventura, 2011; Bourgain et al., 2012) and empirically (Gulamhussen et al., 2014; Cubillas & González, 2014; Lee et al., 2016; Luo et al., 2016), but not reached a consensus. In general, there are two strands of literature explaining how openness may affect bank risk.

The supporting view is that opening to global goods and financial markets helps to reduce bank risk. This is because, the spillover of advanced techniques and expertise from foreign firms and financial institutions can lead to an improvement in efficiency as well as risk management capability of domestic banks and therefore enhance the soundness of domestic banking system (Lensink & Hermes, 2004; Wu et al., 2017). In addition, the so-called "diversification hypothesis" suggests that opening the financial market allows banks to reduce risk by diversifying their investment portfolios (Berger et al., 2017). As multinational firms are more integrated with global markets and thus less affected by domestic economic fluctuations (Wagner, 2012), they are less likely to default on bank loans. Consequently, the overall bank risk can be reduced in economies with higher trade and financial openness. Similar conclusions are also reached in Ashraf et al. (2017) and Bui & Bui (2020).

On the contrary, there are also studies arguing that higher openness is associated with greater bank risk. For example, the "competition-fragility" hypothesis suggests that opening goods and financial markets will increase bank competition, resulting in a shrink of market power as well as a decrease in profit margin and charter value (Hellmann et al., 2000; Repullo, 2004). This induces banks to lower credit standard and invest in more risky portfolios to make up for the profit losses. As a result, banks behave less prudently and the risk of banking system increases. Meanwhile, the reduction of restrictions in international capital movement during the process of financial openness allows banks to broaden their activities and participate in unfamiliar businesses related to foreign markets. However, the lack of sufficient expertise, as well as more serious information asymmetries, would make banks more exposed to external shocks and risks (Kaminsky & Reinhart, 1999; Stiglitz, 2000; Fang et al., 2014; Ashraf et al., 2017).

From the empirical front, numerous researches provide evidence for the effect of openness on bank risk. For example, Anginer & Demirgüç-Kunt (2014) find that financial openness has a negative effect on banking stability, but this negative effect can be mitigated in a strong institutional environment. Similar results are also found in Ali & Iness (2020), who argue that macro-prudential policies can mitigate the negative effect of financial openness on bank stability. Gulamhussen et al. (2014) find robust evidences that internationalization diversification causes an increase in bank risk. Cubillas & González (2014) investigate the relationship between financial liberation and bank risk-taking in 83 countries, and find that financial liberalization increases bank risk-taking through promoting bank competition in developed countries but by expanding opportunities to invest in riskier portfolios in developing countries. Luo et al. (2016) provide evidence that financial openness can increase bank risk indirectly through the profit efficiency channel. In contrast, Ashraf et al. (2017) as well as Bui & Bui (2020) both provide evidence that trade openness helps to reduce bank risk via the diversification channel.

It should be noted that, despite the numerous studies on the effects of openness on bank risk, there are several major inadequacies in the existing literature. First, the results for whether and how openness affects bank risk is largely mixed and no consensus has been reached up to the present. Some researches hold the view that opening up to global goods or financial markets will reduce bank risk (Lensink & Hermes, 2004; Wu et al., 2017; Ashraf et al., 2017; Bui & Bui, 2020), while others suggest the opposite is true (Cubillas & González, 2014; Anginer & Demirgüç-Kunt, 2014; Luo et al., 2016; Ali & Iness, 2020). In light of this, more efforts are needed to verify the relationship between openness and bank risk.

Second, a deep understanding of the relationship between openness and bank risk requires identifying the associated channels through which openness affects bank risk. However, there are only two main channels that have been documented in the existing literature, i.e. the "competition-fragility hypothesis" (Hellmann et al., 2000; Repullo, 2004) and the "diversification hypothesis" (Berger et al., 2017), which arrive at very different conclusions about the effect of openness on bank stability. Moreover, the effect of openness on bank stability may also depend on financial system characteristics such as financial structure, as mentioned in the introduction section, which have not been discussed and fully understood in the existing literature.

To sum up, despite the enormous literature on both theoretical and empirical grounds traditionally assume that openness has an effect on bank stability, the openness-bank stability nexus is still open to debate and the underlying channels through which openness affects bank risk are still not very clear. Meanwhile, there is no study (to the best of our knowledge) up to now which has discussed the role played by financial structure in the link between openness and bank risk. In light of these considerations, this paper aims to revisit the relationship between openness and bank risk, with a particular focus on the role of financial structure as a transmission channel between openness and bank risk. These analyses will further enhance our understanding of the relationship between openness and bank risk as well as the differentiated effects associated with different transmission channels.

3. Methodology and data

3.1 Empirical strategy

As mentioned in the introduction section, considering the possibility that openness may affect financial structure and bank risk simultaneously and financial structure may be a potential channel through which openness affects bank risk, we combine 2SLS procedure with GMM estimation to investigate whether and how openness affect bank risk. This estimation methodology has the benefit of controlling for endogeneity problems arising from reverse causality between financial structure and bank risk as well as their potential simultaneous dependence on openness. The model of two simultaneous equations is as follows:

$$FS_{it} = \alpha_0 + \alpha_1 FS_{it-1} + \alpha_2 ZSCORE_{it} + \alpha_3 FO_{it} + \alpha_4 TO_{it} + \alpha_5 LEGOR_{it} + \alpha_6 CONTROLS_{it} + \mu_i + \lambda_t + \varepsilon_{it} \quad (1)$$

$$ZSCORE_{it} = \beta_0 + \beta_1 ZSCORE_{it-1} + \beta_2 FS_{it} + \beta_3 FO_{it} + \beta_4 TO_{it} + \beta_5 DEPOSIT_{it} + \beta_6 CONTROLS_{it} + \mu_i + \lambda_t + \varepsilon_{it} \quad (2)$$

where *i* and *t* denote country and year, respectively. *FS* denotes financial structure. *ZSCORE* is the proxy variable for bank risk. *FO* and *TO* refer to financial openness and trade openness, respectively. To implement the method of 2SLS procedure with GMM estimation, we include an instrumental variable in each equation: legal origin (*LEGOR*) of country *i* in year *t* for Eq. (1) and deposit insurance (*DEPOSIT*) for Eq. (2). In addition, we also control for bank-specific factors and macroeconomic indicators which may influence bank risk or financial structure. Following the previous studies (e.g., Camara et al., 2013; Cubillas & González, 2014; Köhler, 2015; Luo et al., 2016), we include overhead costs to total assets (*OVERHEAD*), noninterest income to total income (*NI*), net interest margin (*NIM*), and cost to income ratio (*CTI*) as bank-specific controls and GDP growth rate (*GDPR*) as well as inflation rate (*INFLATION*) as macroeconomic controls. At last, μ_i and λ_t are the unobservable country- and time-specific effects, respectively; ε_{it} is the error term.

We use 2SLS procedure with GMM to estimate our model. Specifically, in the first-stage regressions, we apply two-step system GMM to estimate Eqs. (1) and (2) in which observed values of *FS* and *ZSCORE* are used as the dependent variables so as to calculate the predicted values of *FS* and *ZSCORE*. Then in the estimation of the second-stage regressions, the fitted values of these two variables (i.e. *FS* and *ZSCORE)* are used as explanatory variables to estimate Eqs. (1) and (2), also by using two-step system GMM. Following this procedure, if financial openness (*FO*) or trade openness (*TO*) does increase (or decrease) financial structure (*FS*, the relative importance of banking sector to stock market), a significantly positive (or negative) coefficient for α_3 or α_4 is expected. More importantly, this procedure allows us to separate the different effects of openness on bank risk. Taking financial openness for example, β_2 in the *ZSCORE* equation captures the effect of financial openness on bank risk through its impact on financial structure (the "financial structure channel" hereafter), while β_3 refers to the effect of financial openness on bank risk through other potential channels other than the financial structure channel.

In the estimation, the GMM method developed by Arellano & Bond (1991) and Blundell & Bond (1998) helps to address several econometric issues of particular concerns. First, by including a lagged-dependent-variable in the dynamic model estimated by GMM, the likely autoregressive process in the data of dependent variable can be captured (i.e., the dynamic nature of financial structure and bank risk). Second, by taking first differences of variables, GMM allows for controlling the possibility of bias caused by time-invariant or country-specific effect. Third, by using lags of explanatory variables as instruments, GMM can effectively address the potential endogeneity of the explanatory variables in the regressions. However, numerous instruments are frequently encountered with over-identification problems (Roodman, 2009). To overcome this problem, Hansen test is performed to confirm the overall validity of instruments, under which not rejecting the null hypothesis means the instruments are valid. Meanwhile, to check for the potential misspecification of the model, we also perform AR(2) test to ensure that the first differenced error term is not second-order serially correlated.

As in Cubillas & González (2014), besides the lagged value of the dependent variable, we additionally include an instrumental variable in each equation, which is chosen based on both economic and statistical arguments. Specifically, we include legal origin (*LEGOR*) as instrument in Eq. (1), because legal origin is an important determinant of a county's financial structure, as suggested in the theory of "Law and Finance" (La Porta et al., 1997, 1998). As for Eq. (2), we include a dummy variable of explicit deposit insurance scheme as instrument, since there are evidences that deposit insurance may induce greater bank risk by reducing the incentive of depositors to monitor bank activities (Anginer et al., 2014). Meanwhile, we also use the first-stage Wald test and Hansen test to ensure the relevance (correlation with the endogenous variable) and validity (orthogonality to the residual) of the instruments.

3.2 Data and variables

3.2.1 Bank risk

We use Z-score as our main measure of bank risk, which is commonly used in the literature as a measure of bank risk (e.g., Cubillas & González, 2014; Luo et al., 2016; Bui & Bui, 2020). Z-score reflects bank's insolvency risk. Since we collect the Z-score variable from Global Financial Development Database, we follow the World Bank's definition of Z-score as follows:

$$Z\text{-}score = \frac{ROA + E/A}{sd(ROA)} \tag{3}$$

where *ROA* is the rate of return on assets, *E/A* is the equity to asset ratio, and *sd*(*ROA*) is the standard deviation of *ROA*. Z-score captures the default probability of a country's banking system, with a higher Z-score indicating lower bank risk. Meanwhile, because Z-score is highly skewed, we follow the literature (e.g., Houston et al., 2010; Bui & Bui, 2020) by using the natural logarithm of Z-score (which is normally distributed) as the dependent variable. For brevity, we use the label "*ZSCORE*" in referring to this variable in the remainder of the paper.

On top of that, as part of robustness check, we also employ the volatility of ROA as an alternative measure of bank risk, as in Laeven & Levine (2009) and Houston et al. (2010), where the volatility is measured as the standard deviation of ROA (*SD_ROA*) calculated over a 3-year moving window (including the one previous year and the one subsequent year). Quite straightforwardly, a higher volatility of ROA is positively associated with bank risk.

3.2.2 Trade and financial openness

As mentioned earlier, as one of our main variables of interest, openness is measured in two aspects: trade openness and financial openness. The measure of trade openness is quite standard. As suggested by Kim et al. (2010), the total volume of imports and exports to GDP ratio (i.e. $trade\ openness = \frac{imports + exports}{GDP}$) provides a straightforward measure of trade openness. Such a measure is also employed in numerous researches examining the impact of trade openness on bank risk (e.g., Ashraf et al., 2017; Bui & Bui, 2020). Therefore, in our study trade openness (*TO*) is also measured by this ratio.

As for financial openness, there are two main approaches to measure financial openness, namely *de jure* measure and *de facto* measure. For robustness, in this paper, financial openness is measured by several proxies, including both *de jure* and *de facto* indicators. Specifically, the *de jure* financial openness indicator that we use is the Chinn-Ito index (*KAOPEN*), which measures the degree of capital account openness across countries and is constructed and updated by Chinn & Ito (2006). A larger value of the *KAOPEN* index indicates a higher degree of financial openness.

Our second proxy for financial openness is the *de facto* indicator proposed by Lane & Milesi-Ferretti (2007) and later updated in Lane & Milesi-Ferretti (2017), which is also widely used in studies related to financial openness (e.g., Kose et al., 2009; Bui & Bui, 2020). Flowing Lane & Milesi-Ferretti (2007, 2017), our second proxy for financial openness (*FI*) is given by:

$$FI_{it} = \frac{FA_{it}+FL_{it}}{GDP_{it}} \quad (4)$$

where *FA* and *FL* denote the stock of external assets and liabilities respectively, including foreign direct investments, portfolio equity, foreign debt and financial derivatives, plus foreign exchange reserves other than gold holding on the asset side. Moreover, as in Lane & Milesi-Ferretti (2008) and Kose et al. (2009), we also employ the ratio of total external liabilities to GDP and the ratio of total external assets to GDP as two alternative measures of financial openness in the robustness checks.

In addition to the above two widely used indicators, we also use the Fernández-Klein-Rebucci-Schindler-Uribe (FKRSU, hereafter) index proposed by Schindler (2009) and later updated by Fernández et al. (2016) as alternative proxies for financial openness. The FKRSU index is also constructed based on the information of the IMF's AREAER. But unlike the Chinn-Ito index, the FKRSU index not only sum up the overall capital control restrictions but also provide disaggregation of capital control restrictions on both capital inflows (*KAI*) and capital outflows (*KAO*), which allows us to explore the potential differences in the impact of financial openness on bank risk with regard to inflow and outflow restrictions.

3.2.3 Financial structure

Following Beck & Levine (2002) and Levine (2002), we use a continuous variable to measure the relative importance of bank-based finance over market-based finance, which can be defined as:

$$FS = \frac{Private\ credit\ by\ deposit\ money\ banks}{Stock\ market\ capitalization} \quad (5)$$

where stock market capitalization refers to the total value of all listed shares in a country's stock market. This measure of financial structure captures the relative size of banking system to stock market and is widely used in related researches (e.g., Tan et al., 2015; Ye et al., 2021). According to Eq. (5), a higher value of *FS* indicates a more bank-based financial system.

3.2.4 Control variables

As usual, we also include a set of control variables including both bank-specific factors and macroeconomic indicators. In line with the literature related to the determinants of bank risk (e.g., Camara et al., 2013; Cubillas & González, 2014; Köhler, 2015; Luo et al., 2016), we include overhead costs to total assets (*OVERHEAD*), net interest margin (*NIM*), noninterest income to total income (*NI*) and cost to income ratio (*CTI*) as bank-specific control variables. For macroeconomic indicators, we control for GDP growth rate (*GDPR*) and inflation rate (*INFLATION*), as in Demirgüç-Kunt & Huizinga (2010), Mirzaei et al. (2013) and Ali & Iness (2020). A more detailed description of the regression variables is presented in Table A1 in the Appendix.

3.2.5 Data

We construct our sample by first considering all the economies in World Bank's Global Financial Development Database, and then exclude: firstly country-year observations with no information on either of the two main proxies for financial openness (*KAOPEN* and *FI*) mentioned above; secondly country-year observations for which at least one of the bank-specific variables is missing; thirdly country-year observations with the lack of data on country-specific variables. After that, we trim all variables except dummy variables (*LEGOR*, *DEPOSIT*) or variables based on the binary dummy variables (*KAOPEN*, *KAI*, *KAO*) at the 1% and 99% quantile to address the issue of extreme values or outliers. This process leads to an unbalanced panel data covering 97 countries over the period 1996–2017.[1]

Several main data sources are used. The raw data for calculating financial structure and bank-specific variables are collected from the World Bank's Global Financial Development Database. Data for trade openness and country-specific controls are collected from the World Bank's World Development Indicators. The proxies for financial openness are collected from several major databases as mentioned before. Information for sample countries' deposit insurance scheme and legal origin are taken from Demirgüç-Kunt et al. (2014) and La Porta et al. (1997, 1998), respectively. Table 1 reports the descriptive statistics for all variables.

Table 1 Summary statistics of variables.

Variable	Obs.	Mean	Std. Dev.	Min	Max
ZSCORE	1456	2.4897	0.5945	0.4725	3.7500
FS	1456	2.8355	5.7640	0.1650	77.5123
KAOPEN	1456	0.9161	1.4495	-1.9203	2.3336
FI	1328	2.6282	3.3984	0.3861	27.9376
KAI	1282	0.3394	0.3125	0.0000	1.0000
KAO	1282	0.3849	0.3812	0.0000	1.0000
TO	1456	84.6406	45.5447	22.7722	336.4848
GDPR	1456	3.7192	3.0370	-7.3594	13.7000
INFLATION	1456	4.8504	5.1122	-1.3528	45.8038
OVERHEAD	1456	3.1479	2.1566	0.4101	14.5191
NI	1456	36.4067	11.1426	10.8827	78.0822
NIM	1456	3.9864	2.5287	0.5355	16.5020
CTI	1456	56.7543	11.7173	25.6984	94.3387
LEGOR	1456	0.3221	0.4674	0.0000	1.0000
DEPOSIT	1456	0.6786	0.4672	0.0000	1.0000

Notes: This table provides the summary statistics of the variables used in this paper. The sample consists of 97 countries over the period 1996–2017. *ZSCORE* is the nature logarithm of Z-score, as defined in Section 3.2.1. *FS* is the proxy for financial structure calculated as the ratio of private credit by deposit money banks to stock market capitalization. *KAOPEN*, *FI*, *KAI*, *KAO* are alternative proxies for financial openness. *KAOPEN* is the Chinn-Ito index. *FI* is the ratio of total external assets and liabilities to GDP. *KAI* and *KAO* are indices in the FKRSU index, which measure control restrictions on capital inflow and outflow, respectively. *GDPR* is GDP growth

[1] The sample countries included are listed in Table A2 in the Appendix.

rate. *INFLATION* is inflation rate. *OVERHEAD* is overhead costs as a percentage of total assets. *NI* is noninterest income as a percentage of total bank income. *NIM* is net interest margin. *CTI* is cost to income ratio. *LEGOR* is a dummy variable for legal origin which equals 1 if the law system of a country is common law and 0 otherwise. *DEPOSIT* is a dummy variable that equals 1 if a country has explicit deposit insurance scheme and 0 otherwise. The data sources are reported in Table A1 in the Appendix.

4. Empirical results

4.1 Baseline results

In this section, we empirically analyze the relationship between openness, financial structure and bank risk. The 2SLS regression results for the two simultaneous equations specified in models (1) and (2) are reported in Table 2. As described above, the twostep system GMM estimation is applied in both the first and second stages of 2SLS procedure.

Columns (1) and (2) report the results for the financial structure equation using the two alternative proxies for financial openness, in which the predicted value of *ZSCORE* obtained from the first stage by regressing *ZSCORE* on all explanatory variables in Eq. (2) are used. As the results show, the coefficients for both of the two proxies for financial openness (*KAOPEN* and *FI*) are estimated to be significantly negative. This means that, a country's financial system would become more market-based (i.e., the relative importance of banks to stock markets decreases) as financial openness increases. At the same time, the impact of financial openness on financial structure is also economically important. Taking the estimation in Column (1) for example, a one-standard deviation increase in the index of *KAOPEN* will cause a decrease in *FS* of 19.75% of its standard deviation. Such effect of financial openness on financial structure can be partially attributed the fact that, financial system is more likely to be bank-dominated in its infancy, but bank lending tends to be diminished with the increasing financial market sophistication and development, and financial openness will accelerate this process as liberalizing capital control can bring spillover effect and foster the development of stock market by enhancing the liquidity and improving the size of the stock market (Boot & Thakor, 1997; Levine & Zervos, 1998; Levine, 2001; Chinn & Ito, 2006). However, although financial opening up can promote the development of stock market and banking sector simultaneously, it may also strengthen the substitution effect between credit and equity markets (Baltagi et al., 2009; Cheng, 2012). As a result, the relative importance of stock market to bank sector tends to be improved at a higher level of financial openness.

However, the coefficients for trade openness are insignificant in both Columns (1) and (2), indicating that trade openness has no obvious impact on financial structure in our study. As for the macroeconomic controls, the significantly negative coefficient for *GDPR* in Column (1) indicates that the relative importance of banks to stock markets decreases with a higher GDP growth rate. Also, the expected negative and significant coefficient for *LEGOR* in Column (1) confirms that common law countries are more likely to breed a more market-based financial system, consistent with La Porta et al. (1997, 1998).

Columns (3) and (4) report the results for Eq. (2), in which the predicted value of *FS* obtained from the first stage by regressing *FS* on all explanatory variables in Eq. (1) are used. As discussed in Section 3, in this approach, the coefficient for *FS* captures how financial openness affects bank risk through its impact on financial structure, while the coefficient for financial openness captures the effect of financial openness on bank risk through all other channels other than the financial structure channel. As shown in Columns (3) and (4), the coefficients for *FS* are estimated to be significantly negative in both regressions, indicating that a decrease in financial structure (corresponding to a reduction in the relative importance of banks to stock markets) on average reduces bank risk. One possible explanation is that banks face tougher competition in a more bank-based financial system (Demirgüç-Kunt & Huizinga, 2000) while the stock market development could enhance bank market power (Samarasinghe & Uylangco, 2021), and as the "competition-fragility" hypothesis suggests, tougher competition reduces banks' charter value and increases banks' incentive to undertake higher risk to compensate for the lost revenue induced by more competition (Keeley, 1990; Hellmann et al., 2000; Repullo, 2004). As a result, banks behave less prudently and take on greater risks. On the contrary, a more market-based financial system with well-developed stock market would provide more diversification opportunities and better cross-sectional risk sharing (Song & Thakor, 2010; Vithessonthi, 2014), which allows banks to reduce risks by diversifying their portfolios (Berger et al., 2017). In addition, more and better information on publicly traded companies is available in a more market-based financial system, which helps to alleviate the information asymmetry and enables banks to better evaluate credit risks (Beck et al., 2013, Mirzaei et al., 2013).

Turning to the impact of openness, our two proxies for financial openness both have negative and statistically significant coefficients while the coefficients for trade openness are insignificant after controlling for financial structure in Columns (3) and (4). This indicates that, while trade openness shows no significant influence on bank risk, financial openness can also increase bank risk through alternative channels (e.g., the competition channel as discussed in Section 2) other than the financial structure channel. In short, while we identify the financial structure channel indeed exists in the relationship between financial openness and bank risk, it is not the only channel through which financial openness affects bank risk.

In addition, the impact of financial openness on bank risk is also economically important. Taking *KAOPEN* for example, as shown in the path analysis in Figure 4, a one-standard deviation increase in the *KAOPEN* index will cause a decrease of 20.16% of the standard deviation of *ZSCORE* through all potential channels other than the financial structure channel. Furthermore, the result in Figure 4 also suggests that a one-standard deviation increase in the *KAOPEN* index will lead to an increase of 4.65% of the standard deviation of *ZSCORE* through the financial structure channel. This means that, the positive effect of financial openness on bank stability through the financial structure channel can offset 23.07% of the negative effects through all other potential channels. When financial openness is measured by *FI*, such offsetting effect is even greater: the positive effect of financial openness on bank stability through the financial structure channel can offset 33.56% of the negative effects through all other potential channels.

With regard to control variables, the negative and statistically significant coefficients for *GDPR* in Columns (3) and (4) indicate that banks have incentives to behave imprudently in countries or in periods with higher economic growth, which is consistent with Cubillas & González (2014) and Ali & Iness (2020). The positive and statistically significant coefficient for *NI* in Column (3) indicates that banks with a higher ratio of noninterest income to total income tend to behave more prudently, which is in line with "diversification-stability" hypothesis. The coefficient for *NIM* is negative but only statistically significant in Column (4), suggesting that banks with higher net interest margin are likely to behave less prudently. The coefficient for *CTI* is negative and statistically significant in Column (4), which indicates that a higher level of cost to income ratio is associated with lower bank stability. As *CTI* is negatively related to bank efficiency, this result indicates that less efficient banks are more likely to take on higher risk to offset the decreasing return incurred by higher bank competition or tougher capital regulation.

At last, the coefficients for the lagged dependent variable ($FS_{i,t-1}$ in the first two columns and $ZSCORE_{i,t-1}$ in the last two columns) are positive and statistically significant in all regressions, suggesting that financial structure and bank risk both exhibit persistence and thus supporting for the reasonability of using a partial adjustment model to explain the evolution of financial structure and bank risk. Also, from the model tests at the bottom of Table 2, the Wald test suggests that the instruments used are jointly significant. Meanwhile, both Hansen test and AR (2) test do not reject their null hypotheses, indicating that the instruments used in our regressions are valid and there are no second-order autocorrelations in the estimation.

Table 2 Openness, financial structure and bank risk.

	(1) *FS*	(2) *FS*	(3) *ZSCORE*	(4) *ZSCORE*
L.FS	0.5739***	0.4548***		
	(0.0953)	(0.1373)		
L.ZSCORE			0.6177***	0.4378**
			(0.1517)	(0.1715)
ZSCORE	-0.1367	-0.1298		
	(0.8973)	(1.5664)		
FS			-0.0243**	-0.0242*
			(0.0121)	(0.0143)
KAOPEN	-0.7853**		-0.0827**	
	(0.3833)		(0.0381)	
FI		-0.2762**		-0.0199**
		(0.1336)		(0.0093)
TO	0.0089	0.0006	0.0027	-0.0003
	(0.0076)	(0.0126)	(0.0023)	(0.0018)
LEGOR	-1.0243*	-0.2017		
	(0.5882)	(0.4333)		
DEPOSIT			-0.0118	-0.1301*
			(0.0803)	(0.0787)
GDPR	-0.1041**	-0.0698	-0.0142*	-0.0158*
	(0.0475)	(0.0427)	(0.0079)	(0.0081)
INFLATION	-0.0244	0.0256	-0.0010	-0.0064
	(0.0448)	(0.0406)	(0.0052)	(0.0050)
OVERHEAD	-0.0354	0.0832	0.0048	0.0831*
	(0.4350)	(0.5468)	(0.0635)	(0.0504)
NI	0.0049	0.0274	0.0093**	0.0050
	(0.0248)	(0.0308)	(0.0043)	(0.0049)
NIM	0.0936	-0.1727	-0.0143	-0.0625*
	(0.2620)	(0.4585)	(0.0424)	(0.0357)
CTI	0.0020	-0.0445	-0.0082	-0.0105**
	(0.0413)	(0.0575)	(0.0081)	(0.0048)
Year	Yes	Yes	Yes	Yes
Country	Yes	Yes	Yes	Yes
AR (1) *p*-value	0.6213	0.7255	0.0019	0.0056

AR (2) *p*-value	0.9892	0.7771	0.8871	0.5628
Hansen test *p*-value	0.5303	0.7152	0.3861	0.7044
First stage Wald statistic	720.135***	273.812***	357.498***	360.268***
Countries	97	97	97	97
Observations	1456	1328	1456	1328

Notes: The dependent variable in Columns (1) and (2) is financial structure (*FS*). The dependent variable in Columns (3) and (4) is *ZSCORE*, which is the natural logarithm of Z-score. As for explanatory variables, we include one lag of the dependent variables (FS_{t-1} and $ZSCORE_{t-1}$, respectively) and the predicted value of *ZSCORE* (*FS*) obtained in the first stage when *ZSCORE* (*FS*) is the dependent variable. *KAOPEN* and *FI* refer to *de jure* and *de facto* measures of financial openness, respectively. *TO* is trade openness. These variables are defined in Table A1 in the Appendix. All models are estimated by combining 2SLS procedure with system GMM estimation. *L* is an abbreviation to denote the first lag of the respective variables. GMM estimates for variables with standard errors (in parenthesis) using Windmeijer (2005) finite-sample robust standard error correction are reported. All estimations control for country- and time-specific effects, though not reported. The sample size of estimations in Columns (2) and (4) is curtailed due to the availability of data for calculating *FI*. Hansen tests the null hypothesis of instrument validity and AR(2) tests the null hypothesis of the absence of second-order autocorrelation. ***, **, * indicate statistical significance at 1%, 5%, 10% level, respectively.

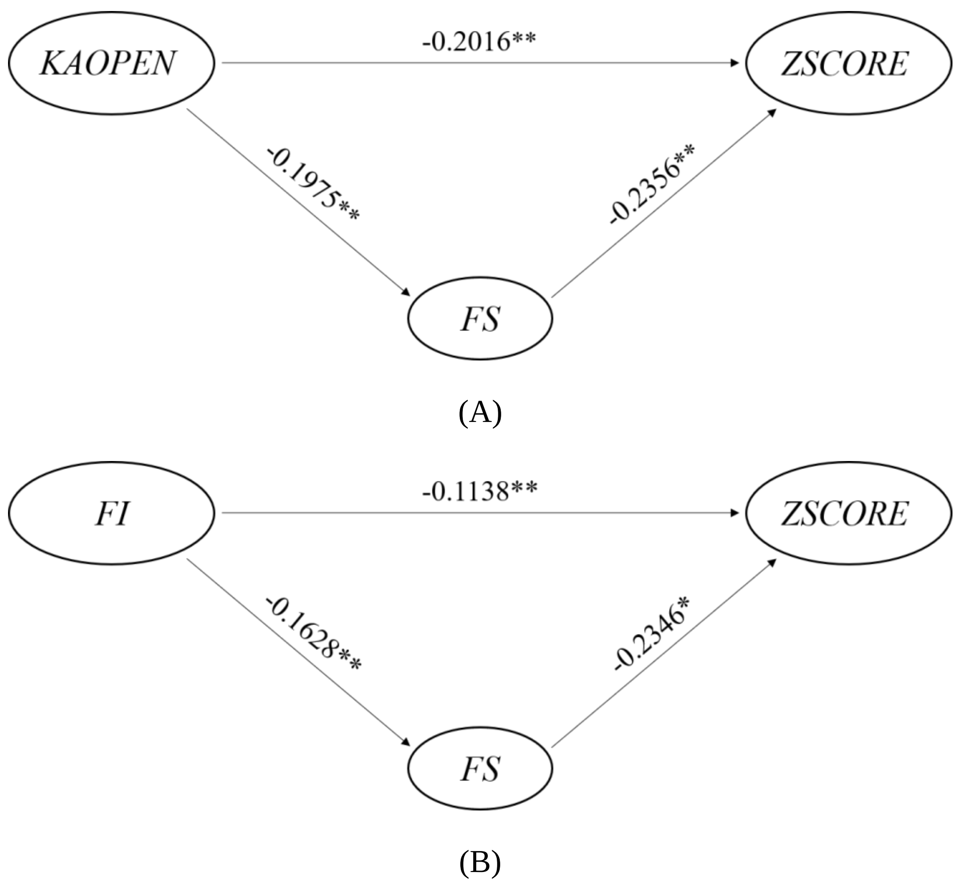

Fig. 4 Path analysis.

Notes: This figure presents a valid demonstrable path of association between financial openness, financial structure, and bank risk. Standardized beta coefficients are shown above the arrows, which are calculated based on the results in Table 2. *ZSCORE* is the nature logarithm of Z-score. *FS* is the proxy for financial structure measured by the ratio of private credit by deposit money banks to stock market capitalization. *KAOPEN* and *FI* refer to de jure and de facto measures of financial openness, respectively. ***, **, * indicate statistical significance at 1%, 5%, 10% level, respectively.

4.2 Inflow restrictions versus outflow restrictions

An interesting issue related to the impact of financial openness on bank risk is whether such impact differs with respect to inflow restrictions and outflow restrictions. To do this, we replace financial openness with separate inflow and outflow measures and re-estimate the regressions. Table 3 reports the results with inflow restrictions (*KAI*) and outflow restrictions (*KAO*) as measures of financial openness.

First of all, the positive and statistically significant coefficients for *KAI* and *KAO* in Eq. (1) as well as the negative and statistically significant coefficients for financial structure (*FS*) in Eq. (2) indicate that higher financial openness would reduce bank risk as the financial system becomes more market-based. This can be seen as additional evidence for the robustness of our baseline results.

As for the differences that we are more interested in, the result gives a more significant and quantitatively larger estimated coefficient for *KAI* in Column (1) than that for *KAO* in Column (2), implying that inflow restriction has a more pronounced effect on financial structure. Note also that the coefficient for predicted *FS* (derived from the first stage regression of Eq. (1) with *KAI* included) in Column (3) is also larger in magnitude and more significant as compared to that for predicted *FS* (derived from the first stage regression of Eq. (1) with *KAO* included) in Column (4). This means that the financial structure channel of inflow restrictions in the relationship between financial openness and bank risk is more pronounced than that of outflow restrictions. It can be explained that, on the one hand, capital inflow is more close to the notion of opening to international capital that is associated with advanced techniques and other spillovers (Kose et al., 2009), which provide advanced experience as well as pressures to improve the domestic financial market such as enriching securities traded and enhancing institutional quality, therefore boosting the development of domestic financial market. On the other hand, inflow restrictions are more effective in determining the movement of capital flows (Pasricha et al., 2018) and thus liberalizing restrictions on capital inflows would lead to a larger change in domestic financial structure caused by the capital flows. Also, while the liberalization of capital inflows can induce a stronger demand for assets in domestic markets (which improves liquidity and promotes the growth of the market), the liberalization of capital outflows may lead to a substitution between assets in domestic and external markets. As a result, compared to outflow restrictions, inflow restrictions exhibit a more pronounced effect on bank risk via the financial structure channel.

In addition, the quantitatively larger coefficient for *KAI* in Column (3) as compared to that for *KAO* in Column (4) also indicates that the positive effect of inflow restrictions on bank stability through other potential channels is more pronounced than that of outflow restrictions. One possible explanation for this result is that inflow restrictions are more related to "competition-fragility" effect: the liberalization of capital inflows increases bank competition in domestic financial market as it offers an alternative source for corporate financing with a competitively low interest, which induces banks to invest more in risky portfolios to compensate for decreasing profit margins, whilst outflow restrictions are more closely related to the "diversification-stability" effect: since less outflow restrictions would provide banks with easier access into international financial markets and thus more opportunities to reduce risk by diversifying their investment portfolios.

Table 3 Openness, financial structure and bank risk: inflow vs. outflow restrictions.

	(1) *FS*	(2) *FS*	(3) *ZSCORE*	(4) *ZSCORE*
L.FS	0.5780***	0.3316**		
	(0.2077)	(0.1399)		
L.ZSCORE			0.4100***	0.3250**
			(0.1374)	(0.1520)
ZSCORE	-1.3369	-1.5219*		
	(0.9468)	(0.9028)		
FS			-0.1269***	-0.1173*
			(0.0460)	(0.0664)
KAI	4.5465**		0.7369*	
	(1.9271)		(0.4130)	
KAO		4.2464**		0.6225*
		(2.1050)		(0.3742)
TO	0.0075	0.0033	0.0009	0.0037*
	(0.0086)	(0.0275)	(0.0012)	(0.0021)
LEGOR	-1.4474*	-0.7443		
	(0.8231)	(0.6026)		
DEPOSIT			-0.0251	-0.0053
			(0.0943)	(0.1299)
GDPR	-0.0453	-0.1274	-0.0077	-0.0187
	(0.0730)	(0.0871)	(0.0128)	(0.0128)
INFLATION	0.0112	-0.0144	0.0063	0.0152*
	(0.0526)	(0.0541)	(0.0061)	(0.0090)
OVERHEAD	0.5491	0.1478	0.0172	0.0144
	(0.5263)	(0.4153)	(0.0479)	(0.0562)
NI	-0.0784*	-0.0191	0.0073**	-0.0029
	(0.0409)	(0.0237)	(0.0036)	(0.0043)
NIM	-0.2906	-0.1805	-0.0072	0.0194
	(0.3523)	(0.3376)	(0.0316)	(0.0447)
CTI	-0.0398	-0.0341	-0.0138**	-0.0032
	(0.0626)	(0.0297)	(0.0057)	(0.0065)
Year	Yes	Yes	Yes	Yes
Country	Yes	Yes	Yes	Yes
AR (1) *p*-value	0.3994	0.7451	0.0114	0.0239
AR (2) *p*-value	0.3827	0.2725	0.9468	0.9601
Hansen test *p*-value	0.9497	0.8913	0.9987	0.8952

First stage Wald statistic	212.2703***	316.2987***	105.0982***	324.3964***
Countries	83	83	83	83
Observations	1282	1282	1282	1282

Notes: The dependent variable in Columns (1) and (2) is financial structure (*FS*). The dependent variable in Columns (3) and (4) is *ZSCORE*, which is the natural logarithm of Z-score. As for explanatory variables, we include one lag of the dependent variables (FS_{t-1} and $ZSCORE_{t-1}$, respectively) and the predicted value of *ZSCORE* (*FS*) obtained in the first stage when *ZSCORE* (*FS*) is the dependent variable. *KAI* measures the degree of capital inflow restrictions. *KAO* measures the degree of capital outflow restrictions. *TO* is trade openness. These variables are defined in Table A1 in the Appendix. All models are estimated by combining 2SLS procedure with system GMM estimation. *L* is an abbreviation to denote the first lag of the respective variables. GMM estimates for variables with standard errors (in parenthesis) using Windmeijer (2005) finite-sample robust standard error correction are reported. All estimations control for country- and time-specific effects, though not reported. Hansen tests the null hypothesis of instrument validity and AR(2) tests the null hypothesis of the absence of second-order autocorrelation. ***, **, * indicate statistical significance at 1%, 5%, 10% level, respectively.

4.3 Transmission channels

After the financial structure channel is identified as a new channel through which financial openness affects bank risk, it would be a worthwhile exercise to further discuss the potential transmission channels associated with this relationship. To do this, we explore the roles of competition, information sharing and revenue diversification in the relationship between financial structure and bank risk. It is worth noting that, as the direct influence of financial openness on bank risk via competition and diversification channels has already been discussed in the previous literature (e.g., Repullo, 2004; Gulamhussen et al., 2014; Cubillas & González, 2014; Berger et al., 2017), here we mainly focus on the indirect influence via the financial structure channel. Figure 3 provides a more intuitive illustration for the differences regarding the underlying channels through which financial openness can affect bank risk, in which we highlight a new role played by financial structure.

In order to conduct empirical analysis, we construct an autoregressive distributed lag (ARDL) system to conduct Granger-causality tests among the variables of interest. Specifically, following Casu & Girardone (2009), Fiordelisi et al. (2011) and Luo et al. (2016), we estimate a system of two simultaneously equations of ARDL model by using dynamic panel GMM estimations:

$$TC_{it} = f_1(TC_{i,lag}, ZSCORE_{i,lag}, FS_{i,lag}) + \alpha_0 + \mu_i + \lambda_t + \varepsilon_{it} \quad (6)$$

$$ZSCORE_{it} = f_2(ZSCORE_{i,lag}, TC_{i,lag}, FS_{i,lag}) + \alpha_0 + \mu_i + \lambda_t + \varepsilon_{it} \quad (7)$$

where *TC* refers to specific variables for the several potential transmission channels (*LERNER*, *INFO* and *NI*). *ZSCORE* denotes the logarithm of Z-score and *FS* denotes financial structure. α_0 is the intercept, λ_t represents time effect, μ_i represents country-specific effect, and ε_{it} is the error term.

Econometrically, Eq. (6) tests whether changes in financial structure precede variations in *TC* while Eq. (7) tests whether changes in *TC* precede variations in bank risk. For example, to investigate the effect of financial structure on bank risk via the competition channel, we can use the proxy for bank's competition *LERNER* as the dependent variable *TC* in Eqs. (6) and (7). Moreover, using GMM to estimate the above system of two simultaneously equations allows us to account for potential endogeneity or simultaneity in the dynamics of bank competition, information sharing, revenue diversification and bank risk, which may be jointly influenced by financial structure. As in Casu & Girardone (2009), Fiordelisi et al. (2011) and Luo et al. (2016), we include two lags for the variables of interest and estimate an AR(2) process. As for the Granger causality analysis, we use a Wald test with the null hypothesis that "the two lags of the causal variable *X* are jointly equal to zero" to test whether *X* is the Granger cause of *Y*, where the sum of the coefficients for the two lagged causal variable *X* represents the "total effect".

Table 4 reports the results. The first two columns analyze whether financial structure affects bank risk through the competition channel, where the Lerner index (*LERNER*) is used as the proxy for bank market power to replace *TC* in the model. From Column (1) in Table 4, we can see that the total effect of financial structure on bank market power is negative and statistically significant, suggesting that a decrease in financial structure (corresponding to a more market-based financial system) would lead to an enhancement of bank market power. On the one hand, stock market development expands banks' lending scope as stock market development reduces banks' cost of equity capital and further opens up segments of the credit market that were previously inaccessible to the banks (Song & Thakor, 2010). On the other hand, banks operating in countries with developed stock markets can receive greater benefits from enhancements in aggregate stock markets since well-developed markets are better positioned to assist bank business through activities such as facilitating banks' monitoring and screening processes and providing a platform to trade securitized instruments (Samarasinghe & Uylangco, 2021). Meanwhile, the results in Column (2) shows that the total effect of *LERNER* on *ZSCORE* is positive and statistically significant, implying that greater bank competition leads to ("Granger causes") lower bank stability, in line with the "competition-fragile" hypothesis. Therefore, the results in Columns (1) and (2) suggest that financial structure can affect bank risk via the bank competition channel.

Turning to the information sharing channel, we use the depth of credit information (*INFO*) to capture the differences in information sharing across countries and replace *TC* by *INFO* in the model for estimation. The data for *INFO* are taken from the World Bank "Doing Business" dataset. As shown in Column (3) of Table 4, the negative and statistically significant coefficient for the total effect of *FS* on *INFO* indicates that a more market-based financial system is associated with more and better information about companies. Meanwhile, the positive and statistically significant coefficient for the total effect of *INFO* on *ZSCORE* in Column (4) indicates that less information asymmetry alleviated by information sharing would benefit bank's stability. This means that, the information sharing channel through which financial structure affect bank risk is evidenced. Specifically, better information sharing in a more-market based financial system helps to alleviate information asymmetry, which allows banks to monitor borrowers more easily and thus reduce bank risk caused by adverse selection and moral hazard.

Regarding to the revenue diversification channel, following Luo et al. (2016) and Vithessonthi (2014), we use the ratio of noninterest income to total income (*NI*) as the proxy for revenue diversification, and then replace *TC* by *NI* in the model. As shown in the last two columns in Table 4, the negative and statistically significant coefficient for the total effect of *FS* on *NI* in Column (5) indicates that a more bank-based financial system (higher relative importance of bank to stock market in the financial system) leads to ("Granger causes") lower bank revenue diversification, while the positive and statistically significant coefficient of the total effect of *NI* on *ZSCORE* in Column (6) suggests that better bank revenue diversification leads to ("Granger causes") lower bank risk. These results suggest that moving toward a more market-based financial system (the improvement of relative importance of stock market to banking sector) would benefit bank stability by providing more opportunities for banks to diversify revenues. As noted by Demirgüç-Kunt & Huizinga (2010), banks can benefit from extending their business into non-interest income activities by increasing asset return and enjoying better risk diversification.

Table 4 Openness, financial structure and bank risk: transition channels.

	(1) *LERNER*	(2) *ZSCORE*	(3) *INFO*	(4) *ZSCORE*	(5) *NI*	(6) *ZSCORE*
L.LERNER	0.5572**	1.4982***				
	(0.2719)	(0.5237)				
L2.LERNER	0.1872	-1.0916**				
	(0.2479)	(0.4637)				
∑ *LERNER*		0.4066**				
$Prob. > \chi^2$		0.0238				
L.INFO			0.6321**	0.0301		
			(0.2463)	(0.0512)		
L2.INFO			0.1792	-0.0138		
			(0.1706)	(0.0490)		
∑ *INFO*				0.0163*		
$Prob. > \chi^2$				0.0517		
L.NI					0.6485***	0.0160**
					(0.0534)	(0.0074)
L2.NI					0.0925*	-0.0091*
					(0.0537)	(0.0047)
∑ *NI*						0.0069*
$Prob. > \chi^2$						0.0683
L.ZSCORE	-0.0970*	0.5941**	0.9810*	0.5955***	-6.6055	0.5311*
	(0.0504)	(0.2824)	(0.5792)	(0.1238)	(5.5604)	(0.2857)
L2. ZSCORE	0.0107	0.3731*	-0.6753	0.3320***	3.2652	0.2376
	(0.0544)	(0.2087)	(0.5080)	(0.1025)	(4.5910)	(0.1619)
∑ *ZSCORE*	-0.0863		0.3057		3.3403	
$Prob. > \chi^2$	0.1950		0.4065		0.3620	
L.FS	-0.0042**	0.0083	0.0127	0.0013	-0.0575	0.0269
	(0.0017)	(0.0054)	(0.0298)	(0.0114)	(0.1146)	(0.0378)
L2.FS	0.0017*	-0.0067*	-0.0443	0.0009	-0.2131*	-0.0324
	(0.0010)	(0.0036)	(0.0310)	(0.0138)	(0.1190)	(0.0356)
∑ *FS*	-0.0025*	0.0016	-0.0316**	0.0022	-0.2706**	-0.0055
$Prob. > \chi^2$	0.0788	0.7037	0.0356	0.5647	0.0340	0.5106
Year	Yes	Yes	Yes	Yes	Yes	Yes
Country	Yes	Yes	Yes	Yes	Yes	Yes
AR (1) *p*-value	0.2604	0.1452	0.1965	0.1492	0.0000	0.1624
AR (2) *p*-value	0.4586	0.1859	0.2962	0.0433	0.1910	0.2048
Hansen test *p*-value	0.3157	0.2122	0.8661	0.2156	0.1794	0.2779
Countries	82	82	79	79	93	93

Observations	1034	1034	478	478	1293	1293

Notes: The dependent variable in Column (1) is *LERNER*, a proxy for bank competition. The dependent variable in Column (3) is *INFO*, a proxy for the level of information sharing. The dependent variable in Column (5) is *NI*, a proxy for bank's revenue diversification. The dependent variable in Columns (2), (4) and (6) is *ZSCORE*, which is the natural logarithm of Z-score. *FS* is financial structure, measured as the relative importance of bank-based finance over market-based finance. These variables are defined in Table A1 in the Appendix. All models are estimated using the ARDL dynamic panel system with two lags. *L* and *L2* are abbreviations to denote the first and second lags of the respective variables. GMM estimates for variables with standard errors (in parenthesis) using Windmeijer (2005) finite-sample robust standard error correction are reported. All estimations control for country- and time-specific effects, though not reported. The sample size of estimations is dependent on the availability of data. Hansen tests the null hypothesis of instrument validity and AR(2) tests the null hypothesis of the absence of second-order autocorrelation. ***, **, * indicate statistical significance at 1%, 5%, 10% level, respectively.

4.4 Subsample analysis

In this section, we proceed to check the sensitivity of our main results to various subsamples. First, we take into account country heterogeneities and investigate whether the results are robust in different groups of countries. To address this issue, we divide the entire sample countries into two subgroups (i.e., high-income countries vs. low- and middle-income countries) according to the World Bank's classification of countries and then re-estimate the regressions for each subsample separately.[2] The regression results are reported in Table 5, from which we can see that the sign and significance of the estimated coefficients for financial openness and financial structure remain consistent with the baseline results in both subsamples, supporting the robustness of our baseline results.

As for the differences between the two subgroups of countries, one can see that although the effect of financial openness on financial structure is larger in low- and middle-income countries than that in high-income countries (as the estimated coefficient for financial openness in Column 3 is larger than that in Column 1 in Table 5), the degree to which the positive effect of financial openness on bank stability through the financial structure channel offsets the negative effects through all other potential channels turns out to be lower in low- and middle-income countries (26.74% in low- and middle-income countries versus 56.84% in high-income countries). This result is probably due to the fact that high-income countries are more financially developed and banks are better-skilled, and more developed domestic financial markets not only provide better diversification opportunities but also allows stock markets to be better positioned to assist bank business through activities such as facilitating bank's monitoring and screening processes and providing a platform to trade securitized instruments (Samarasinghe & Uylangco, 2021). In other words, banks in financially more developed countries are less affected by external financial markets and rely more on domestic financial markets. As a result, the marginal impact associated with the financial structure channel increases while that through the competition or diversification channel decreases. On the contrary, the less-developed financial markets in low- and middle-income countries limit the complementary effect of stock market to banking sector on the one hand, and amplify the effect of financial openness on bank risk through other

[2] The sample countries divided by income groups are presented in Table A2 in the Appendix.

channels such as the competition channel on the other hand, since domestic banks are less competitive than their foreign counterparts.

Table 5 Openness, financial structure and bank risk: country heterogeneity.

	High-income countries		Low- and middle-income countries	
	(1)	(2)	(3)	(4)
	FS	*ZSCORE*	*FS*	*ZSCORE*
L.FS	0.7415***		0.7417***	
	(0.0737)		(0.2594)	
L.ZSCORE		0.4655*		0.6730***
		(0.2684)		(0.1910)
ZSCORE	-1.4681		-1.9094*	
	(1.2617)		(1.0432)	
FS		-0.1107***		-0.0276*
		(0.0365)		(0.0154)
KAOPEN	-0.9242*	-0.1800*	-1.1608*	-0.1198*
	(0.5334)	(0.1005)	(0.6660)	(0.0718)
TO	0.0188	0.0004	0.0226	0.0105**
	(0.0172)	(0.0041)	(0.0152)	(0.0052)
LEGOR	1.0291		-1.1556	
	(1.9988)		(1.0010)	
DEPOSIT		-0.0955		0.1615
		(0.1762)		(0.2816)
CONTROLS	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes
Country	Yes	Yes	Yes	Yes
AR (1) *p*-value	0.4674	0.0827	0.2943	0.0255
AR (2) *p*-value	0.5177	0.6333	0.8303	0.4094
Hansen test *p*-value	0.7246	0.9830	0.9811	0.7761
First stage Wald statistic	652.218***	93.141***	308.575***	1512.762***
Countries	45	45	52	52
Observations	729	729	727	727

Notes: The dependent variable in Columns (1) and (3) is financial structure (*FS*). The dependent variable in Columns (2) and (4) is *ZSCORE*, which is the natural logarithm of Z-score. As for explanatory variables, we include one lag of the dependent variables (FS_{t-1} and $ZSCORE_{t-1}$, respectively) and the predicted value of *ZSCORE* (*FS*) obtained in the first stage when *ZSCORE* (*FS*) is the dependent variable. *KAOPEN* refers to *de jure* measure of financial openness. *TO* is trade openness. *CONTROLS* is a set of control variables including *GDPR*, *INFLATION*, *OVERHEAD*, *NI*, *NIM* and *CTI*. These variables are defined in Table A1 in the Appendix. All models are estimated by combining 2SLS procedure with system GMM estimation. *L* is an abbreviation to denote the first lag of the respective variables. GMM estimates for variables with standard errors (in parenthesis) using Windmeijer (2005) finite-sample robust standard error correction are reported. All estimations control for country- and time-specific effects, though not reported. The sample countries used for the estimations in Columns (1) and (2) are high-income countries while the sample countries used for estimations in Columns (3) and (4) are low- and middle-income countries. The sample countries divided by income groups according to the World Bank's classification are presented in Table A2 in the Appendix. Hansen tests the null hypothesis of instrument validity and AR(2) tests the null hypothesis of the absence of second-order autocorrelation. ***, **, * indicate statistical significance at 1%, 5%, 10% level, respectively.

Second, as Figure 2 reveals, the decreasing trend of the relative importance of banking sector to stock market was interrupted by the 2008 global financial crisis, which reflects a likely influence of financial crisis on the evolution of financial system. Therefore, to account for the potential influence of the 2008 financial crisis, we also investigate whether the effect of openness on bank risk changes before and after the global financial crisis, as in Cubillas & González (2014) and Luo et al. (2016). To this end, we divide the entire sample into pre-crisis (1996–2007) and post-crisis (2008–2017) subperiods and re-estimate the regressions for each subperiod. The results are reported in Table 6. Obviously, the sign and significance of the estimated coefficients for financial openness and financial structure remain consistent in both the pre-crisis and post-crisis subperiods, suggesting that the baseline results do not change across time. However, it is very interesting that the positive effect of financial openness on bank stability through the financial structure channel is strengthened while the negative effect of financial openness on bank stability through other channels is weakened after the global financial crisis. This may be due to the fact that the global financial crisis improves supervisory authorities' awareness of bank risk, and the introduction of various regulatory policies (e.g., macro-prudential instruments suggested in Basel Ⅲ). These policy efforts are very likely to be effective in controlling the negative effect of financial openness on bank stability. For example, Ali & Iness (2020) empirically find that the negative impacts of capital inflows are alleviated by the implementation of macro-prudential policies in domestic countries, especially through measures imposing limits on foreign currency loans.

Table 6 Openness, financial structure and bank risk: subperiods.

	1996–2007		2008–2017	
	(1)	(2)	(3)	(4)
	FS	*ZSCORE*	*FS*	*ZSCORE*
L.FS	0.5621***		0.5814***	
	(0.1560)		(0.1768)	
L.ZSCORE		0.6153***		0.7280***
		(0.1678)		(0.0906)
ZSCORE	-0.9090		-17.5070*	
	(0.8569)		(9.3386)	
FS		-0.0385*		-0.0781**
		(0.0218)		(0.0336)
KAOPEN	-0.7048*	-0.1114*	-0.8899*	-0.0840*
	(0.3925)	(0.0648)	(0.4749)	(0.0492)
TO	-0.0125	0.0017	0.2301*	0.0025**
	(0.0168)	(0.0032)	(0.1288)	(0.0012)
LEGOR	-0.8029		-0.0543	

	(0.7966)		(1.0993)	
DEPOSIT		-0.0271		0.0070
		(0.0946)		(0.0895)
CONTROLS	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes
Country	Yes	Yes	Yes	Yes
AR (1) *p*-value	0.7997	0.0069	0.1702	0.0008
AR (2) *p*-value	0.9461	0.7452	0.1064	0.1611
Hansen test *p*-value	0.9560	0.8239	0.9700	0.7008
First stage Wald statistic	175.9191***	61.0807***	68.7204***	158.7121***
Countries	94	94	94	94
Observations	802	802	654	654

Notes: The dependent variable in Columns (1) and (3) is financial structure (*FS*). The dependent variable in Columns (2) and (4) is *ZSCORE*, which is the natural logarithm of Z-score. As for explanatory variables, we include one lag of the dependent variables (FS_{t-1} and $ZSCORE_{t-1}$, respectively) and the predicted value of *ZSCORE* (*FS*) obtained in the first stage when *ZSCORE* (*FS*) is the dependent variable. *KAOPEN* refers to *de jure* measure of financial openness. *TO* is trade openness. *CONTROLS* is a set of control variables including *GDPR*, *INFLATION*, *OVERHEAD*, *NI*, *NIM* and *CTI*. These variables are defined in Table A1 in the Appendix. All models are estimated by combining 2SLS procedure with system GMM estimation. *L* is an abbreviation to denote the first lag of the respective variables. GMM estimates for variables with standard errors (in parenthesis) using Windmeijer (2005) finite-sample robust standard error correction are reported. All estimations control for country- and time-specific effects, though not reported. The sample used for the estimations in Columns (1) and (2) is pre-crisis subperiod covering 1996–2007 while the sample used for estimations in Columns (3) and (4) is post-crisis subperiod covering 2008–2017. Hansen tests the null hypothesis of instrument validity and AR(2) tests the null hypothesis of the absence of second-order autocorrelation. ***, **, * indicate statistical significance at 1%, 5%, 10% level, respectively.

4.5 Additional robustness tests

In this section, we conduct several robustness tests to ensure the consistency of our main findings. First, following previous studies (e.g., Houston et al., 2010; Cubillas & González, 2014), we check the robustness of our baseline results by using the volatility of return on asset (*SD_ROA*) as an alternative proxy for bank risk. As the volatility of ROA is positively related to bank risk, we expect an opposite sign of the estimated coefficients for main explanatory variables when replacing *ZSCORE* by *SD_ROA*. Table 7 reports the results. Overall, the estimated coefficients for financial openness (*KAOPEN* or *FI*) in Columns (1) and (2) are negative and statistically significant while those for *FS* in Columns (3) and (4) are positive and statistically significant. This again supports the robustness of our baseline results.

Table 7 Robustness tests using *SD_ROA* as alternative proxy for bank risk.

	(1) *FS*	(2) *FS*	(3) *SD_ROA*	(4) *SD_ROA*
L.FS	0.3865**	0.5532***		
	(0.1536)	(0.1583)		
L.SD_ROA			0.2417***	0.1507
			(0.0745)	(0.2314)
SD_ROA	1.4640	1.0352		
	(1.4923)	(1.1745)		
FS			0.0203*	0.2611***
			(0.0104)	(0.0957)
KAOPEN	-1.0245*		0.1754*	
	(0.5502)		(0.0902)	
FI		-0.4525*		0.1252***
		(0.2643)		(0.0361)
TO	0.0125	0.0256*	-0.0042	0.0047
	(0.0078)	(0.0152)	(0.0034)	(0.0052)
LEGOR	-1.5200**	-0.5862		
	(0.6576)	(0.9306)		
DEPOSIT			-0.6853*	-0.0058
			(0.3748)	(0.1527)
CONTROLS	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes
Country	Yes	Yes	Yes	Yes
AR (1) *p*-value	0.7864	0.7115	0.0030	0.6385
AR (2) *p*-value	0.6563	0.9976	0.8888	0.6416
Hansen test *p*-value	0.6127	0.6853	0.9985	0.1250
First stage Wald statistic	192.7248***	203.2230***	530.6002***	131.7406***
Countries	97	97	97	97
Observations	1321	1242	1321	1242

Notes: The dependent variable in Columns (1) and (2) is financial structure (*FS*). The dependent variable in Columns (3) and (4) is the volatility of return on asset (*SD_ROA*). As for explanatory variables, we include one lag of the dependent variables (FS_{t-1} and SD_ROA_{t-1}, respectively) and the predicted value of *SD_ROA* (*FS*) obtained in the first stage when *SD_ROA* (*FS*) is the dependent variable. *KAOPEN* and *FI* refer to *de jure* and *de facto* measures of financial openness, respectively. *TO* is trade openness. *CONTROLS* is a set of control variables including *GDPR*, *INFLATION*, *OVERHEAD*, *NI*, *NIM* and *CTI*. These variables are defined in Table A1 in the Appendix. All models are estimated by combining 2SLS procedure with system GMM estimation. *L* is an abbreviation to denote the first lag of the respective variables. GMM estimates for variables with standard errors (in parenthesis) using Windmeijer (2005) finite-sample robust standard error correction are reported. All estimations control for country- and time-specific effects, though not reported. The sample size of estimations in Columns (2) and (4) is curtailed due to the availability of data for calculating *FI*. Hansen tests the null hypothesis of instrument validity and AR(2) tests the null hypothesis of the absence of second-order autocorrelation. ***, **, * indicate statistical significance at 1%, 5%, 10% level, respectively.

Second, as in Lane & Milesi-Ferretti (2008) and Kose et al. (2009), apart from the aggregate stock of external liabilities and assets, we also separately consider the gross stock of external liabilities (*FL*, a cumulated measure of inflows) as well as the gross stock of external assets (*FA*, a cumulated measure of outflows) as alternative *de facto* measures of financial openness. This not only checks the robustness of the baseline results but also provides additional evidence for the differences in the effect of capital inflows and outflows on bank risk through the financial structure channel. From the estimation results in Table 8, we can see that both the sign and significance of the estimated coefficients for financial openness and financial structure variables remain consistent with the baseline results. With respect to the different effects associated with capital inflows and outflows, the results indicate that capital inflows would have a greater impact on bank risk through the financial structure channel than capital outflows.

Table 8 Robustness tests using *FL* and *FA* as alternative proxies for financial openness.

	(1) *FS*	(2) *FS*	(3) *ZSCORE*	(4) *ZSCORE*
L.FS	0.6220***	0.4752***		
	(0.1576)	(0.1421)		
L.ZSCORE			0.4979**	0.6283***
			(0.2371)	(0.1017)
ZSCORE	-0.8104	-0.8201		
	(1.2334)	(1.3676)		
FS			-0.1011**	-0.0278*
			(0.0478)	(0.0147)
FL	-0.8866*		-0.0387*	
	(0.4751)		(0.0206)	
FA		-0.3406*		-0.0367*
		(0.1850)		(0.0221)
TO	-0.0024	-0.0046	-0.0010	-0.0006
	(0.0181)	(0.0191)	(0.0016)	(0.0015)
LEGOR	-0.5740	-0.7617*		
	(0.7965)	(0.4625)		
DEPOSIT			-0.1221*	-0.1376**
			(0.0730)	(0.0583)
CONTROLS	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes
Country	Yes	Yes	Yes	Yes
AR (1) *p*-value	0.3320	0.6667	0.0359	0.0004
AR (2) *p*-value	0.8728	0.8126	0.9646	0.6362
Hansen test *p*-value	0.3400	0.4943	0.5786	0.9709
First stage Wald statistic	206.4429***	445.5395***	92.7471***	689.8733***
Countries	97	97	97	97
Observations	1338	1323	1338	1323

Notes: The dependent variable in Columns (1) and (2) is financial structure (*FS*). The dependent variable in Columns (3) and (4) is *ZSCORE*, which is the natural logarithm of Z-score. As for explanatory variables, we include one lag of the dependent variables *(*FS_{t-1} and $ZSCORE_{t-1}$, respectively) and the predicted value of *ZSCORE* (*FS*) obtained in the first stage when *ZSCORE* (*FS*) is the dependent variable. *FL* and *FA* are the ratios of total external liabilities to GDP and total external assets to GDP, respectively. *TO* is trade openness. *CONTROLS* is a set of control variables including *GDPR*, *INFLATION*, *OVERHEAD*, *NI*, *NIM* and *CTI*. These variables are defined in Table A1 in the Appendix. All models are estimated by combining 2SLS procedure with system GMM estimation. *L* is an abbreviation to denote the first lag of the respective variables. GMM estimates for variables with standard errors (in parenthesis) using Windmeijer (2005) finite-sample robust standard error correction are reported. All estimations control for country- and time-specific effects, though not reported. The difference in sample size is due to the availability of data for calculating *FL* and *FA*. Hansen tests the null hypothesis of instrument validity and AR(2) tests the null hypothesis of the absence of second-order autocorrelation. ***, **, * indicate statistical significance at 1%, 5%, 10% level, respectively.

Finally, we also check the robustness of our baseline results by introducing additional control variables that may have an influence on bank risk. Specifically, we add macro-prudential policy index (*MPI*) to control for the impact of macro-prudential regulation and legal protection (LEGALRIGHTS) to control for the strength of institutions protecting lending in a country. As is evident in Table 9, after including these additional controls, the impact of financial openness (*KAOPEN* or *FI*) and financial structure (*FS*) on bank risk remains the same as the baseline results, which again supports the robustness of our main conclusions.

Table 9 Robustness tests including *MPI* and *LEGALRIGHT* as additional control variables.

	(1) *FS*	(2) *FS*	(3) *ZSCORE*	(4) *ZSCORE*
L.FS	0.6132***	0.4850***		
	(0.1398)	(0.1338)		
L.ZSCORE			0.3764**	0.0852
			(0.1586)	(0.1143)
ZSCORE	-3.1756*	-3.8349		
	(1.7673)	(2.3915)		
FS			-0.0641*	-0.1059**
			(0.0377)	(0.0537)
KAOPEN	-0.8644*		-0.1123**	
	(0.4996)		(0.0553)	
FI		-0.1053*		-0.0751**
		(0.0630)		(0.0319)
TO	0.0177	0.0176	0.0037**	0.0034
	(0.0113)	(0.0134)	(0.0017)	(0.0034)
LEGOR	-1.2010*	-0.4282		
	(0.6700)	(0.8530)		
DEPOSIT			-0.1014	-0.1277
			(0.0926)	(0.1255)

CONTROLS	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes
Country	Yes	Yes	Yes	Yes
N	730	624	730	624
AR (1) *p*-value	0.3081	0.6429	0.0205	0.0530
AR (2) *p*-value	0.7614	0.7661	0.1304	0.4921
Hansen test *p*-value	0.4016	0.1853	0.4779	0.5296
First stage Wald statistic	297.166***	703.719***	216.611***	437.193***
Countries	87	85	87	85
Observations	730	624	730	624

Notes: The dependent variable in Columns (1) and (2) is financial structure (*FS*). The dependent variable in Columns (3) and (4) is *ZSCORE*, which is the natural logarithm of Z-score. As for explanatory variables, we include one lag of the dependent variables (FS_{t-1} and $ZSCORE_{t-1}$, respectively) and the predicted value of *ZSCORE* (*FS*) obtained in the first stage when *ZSCORE* (*FS*) is the dependent variable. *KAOPEN* and *FI* refer to *de jure* and *de facto* measures of financial openness, respectively. *TO* is trade openness. *CONTROLS* is a set of control variables including *GDPR*, *INFLATION*, *OVERHEAD*, *NI*, *NIM*, *CTI*, *MPI* and *LEGALRIGHTS*. These variables are defined in Table A1 in the Appendix. All models are estimated by combining 2SLS procedure with system GMM estimation. *L* is an abbreviation to denote the first lag of the respective variables. GMM estimates for variables with standard errors (in parenthesis) using Windmeijer (2005) finite-sample robust standard error correction are reported. All estimations control for country- and time-specific effects, though not reported. The sample size of estimations in Columns (2) and (4) is curtailed due to the availability of data for calculating *FI*. Hansen tests the null hypothesis of instrument validity and AR(2) tests the null hypothesis of the absence of second-order autocorrelation. ***, **, * indicate statistical significance at 1%, 5%, 10% level, respectively.

5. Conclusions

Using panel data from a large cross-country sample covering 97 countries over the period 1996–2017, we combine 2SLS procedure with system GMM estimation to study the relationship between openness, financial structure and bank risk. The estimation strategy adopted in this paper has the benefit of controlling for endogeneity problems arising from reverse causality between financial structure and bank risk as well as their potential simultaneous dependence on openness. Besides estimation strategy, the main contributions of the paper lie in the following aspects:

First and most importantly, we have identified a new channel, i.e. the financial structure channel, through which financial openness affects bank risk. Specifically, we find that as financial openness increases, a country's financial system tends to be more market-based, and a more market-based financial system is generally associated with less bank risk. To the best of our knowledge, this paper is the first that has explicitly separated the financial structure channel from other alternative channels documented in the literature.

Second, we also further explore why banks in a more market-based financial system tend to undertake less risk. We find that moving toward a more market-based financial system would enhance bank market power, improve information sharing and facilitate revenue diversification, and all these effects would contribute to bank stability. Moreover, we also find that the effect of inflow restriction on bank risk is more pronounced than that of outflow restrictions.

Third, a direct policy implication that can be drawn from our analysis is that financial structure matters for the design of a country's opening-up strategy. In particular, in a bank-based financial system, speeding up financial opening-up may not be a wise choice. A more appropriate strategy is to balance the rhythm of financial opening-up with the development of domestic financial markets. In addition, policy makers should also be aware of the differentiated effects associated with different channels when promoting financial opening-up and adopt targeted policies in a well-designed policy framework to reduce bank risk.

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Appendix A

Table A1

Definitions and sources of variables.

Variable	Definition	Source
ZSCORE	The indicator of bank stability, calculated as the natural logarithm of $Z\text{-}score = (ROA + E/A)/sd(ROA)$, where ROA is the return on asset, E/A is the equity to asset ratio and *sd*(*ROA*) is the standard deviation of return on asset.	GFDD*
FS	A measure reflects the relative importance of bank-based finance over market-based finance, calculated as the ratio of private credit by deposit money banks to stock market capitalization.	Authors' calculation using data from GFDD
KAOPEN	This index is developed and updated by Chinn & Ito (2006), which measures capital account openness based on four binary variables reported in the IMF's AREAER.	Chinn & Ito (2006)
FI	A *de facto* indicator of financial openness calculated as: $FI_{it} = (FA_{it} + FL_{it})/GDP_{it}$, where *FA* and *FL* are the stock of external assets and liabilities, respectively.	Lane & Milesi-Ferretti (2017)
KAI	This index measures the degree of control restrictions on capital inflows, constructed based on the information of the IMF's Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER).	Fernández et al. (2016)
KAO	This index measures the degree of control restrictions on capital outflows, constructed based on the information of the IMF's Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER).	Fernández et al. (2016)
TO	The ratio of the total volume of imports and exports to GDP.	WDI**

GDPR	Real annual GDP growth rate.	WDI
INFLATION	Consumer price inflation rate.	WDI
OVERHEAD	Operating expenses as a share of total bank asset.	GFDD
NI	Bank's income generated by noninterest related activities as a percentage of total income.	GFDD
NIM	Bank's net interest revenue as a share of interest-bearing assets.	GFDD
CTI	Operating expenses as a share of sum of net-interest revenue and other operating income.	GFDD
LERNER	A measure calculated as the difference between output prices and marginal costs, with a larger value indicating greater market power.	GFDD
LEGOR	A dummy variable for legal origin which takes the value of 1 if the law system of a country is based on common law and 0 otherwise.	La Porta et al. (1997, 1998)
DEPOSIT	A dummy variable for deposit insurance which takes the value of 1 if a country has established an explicit deposit insurance scheme and 0 otherwise.	Demirgüç-Kunt et al. (2014)
INFO	An index ranging from 0-6, with a higher value indicating better coverage, scope and accessibility of credit information.	World Bank's Doing Business database
MPI	The overall index of macroprudential policy by summing up dummy variables (0-1) for the use of 17 instruments.	Alam et al. (2019)
LEGALRIGHTS	The legal rights index measures whether certain features that facilitate lending exist within the applicable collateral and bankruptcy laws. The score ranges from 0-100, with a higher value indicating higher strength of legal rights.	World Bank's Doing Business database

Notes: (1) * GFDD refers to the World Bank's Global Financial Development Database; (2) ** WDI denotes World Bank's World Development Indicators.

Table A2

List of countries included in the study.

High-income countries		Low- and middle-income countries	
Australia	Netherlands	Algeria	Malaysia
Austria	New Zealand	Armenia	Mauritius
Bahrain	Norway	Bangladesh	Mexico
Barbados	Oman	Bolivia	Mongolia
Belgium	Panama	Bosnia and Herzegovina	Morocco
Canada	Poland	Botswana	Namibia
Chile	Portugal	Brazil	Nepal
Croatia	Qatar	Bulgaria	Nigeria
Cyprus	Saudi Arabia	China	North Macedonia
Czech Republic	Singapore	Colombia	Pakistan
Denmark	Slovak Republic	Costa Rica	Paraguay
Estonia	Slovenia	Côte d'Ivoire	Peru
Finland	Spain	Ecuador	Philippines
France	Sweden	Egypt, Arab Rep.	Romania

Germany	Switzerland	El Salvador	Russian Federation
Greece	United Arab Emirates	Eswatini	South Africa
Hungary	United Kingdom	Georgia	Sri Lanka
Ireland	United States	Ghana	Tanzania
Israel	Uruguay	India	Thailand
Italy		Indonesia	Tunisia
Japan		Jamaica	Turkey
Korea, Rep.		Jordan	Uganda
Kuwait		Kenya	Ukraine
Latvia		Kyrgyz Republic	Venezuela, RB
Lithuania		Lebanon	Vietnam
Malta		Malawi	Zambia