# Financial Sector Volatility, Banking Market Structure and Exports

**Pei-Chien Lin**
Department of Industrial Economics
Tamkang University

**Ho-Chuan (River) Huang** [1]
Department of Banking and Finance
Tamkang University

December 28, 2013

[1]**Corresponding author**: Ho-Chuan (River) Huang, Professor, Department of Banking and Finance, Tamkang University, #151, Yingzhuan Rd., Danshui Dist., New Taipei City 25137, Taiwan, R.O.C., **river@mail.tku.edu.tw**.

**Abstract**

This paper assesses the impacts of financial sector volatility and banking market structure on industrial exports. By utilizing the specification of Rajan and Zingales (1998) on the cross-country, cross-industry data from Manova (2008), we find that financial sector volatility, measured as the standard deviation of the growth of private credit, and banking market structure, measured as the share of the three largest banks' assets in a country, respectively exert significantly negative and positive impacts on industrial exports, particularly for those industries that are more externally financially dependent. The findings are robust to a variety of kinds of sensitivity analysis, and thus lend support to the notion that a more stable and concentrated banking system is important to the exports of those industries that rely more on external finance.

*Keywords:* Financial development, Financial sector volatility, Banking market structure, Exports

*JEL Classification:* F10, F14, G20, G21

# 1 Introduction

Since the seminal work of King and Levine (1993a, 1993b), an enormous literature has been devoted to investigating the finance-growth nexus. [1] More recently, a ramification extended to the literature on international trade suggests that financial development could also be a potential source of a country's comparative advantage. For instance, Kletzer and Bardhan (1987) and Baldwin (1989) develop theories that augment the Heckscher-Ohlin model by incorporating a financial sector and show that financial development gives countries a comparative advantage in industries that rely more on external financing, thereby theoretically suggesting that the level of financial development may importantly influence the pattern of international trade. Correspondingly, Beck (2002, 2003) and Svaleryd and Vlachos (2005), using either cross-country or cross-country cross-industry data, empirically reveal the existence of a positive relationship between financial development and the specialization pattern of trade and comparative advantage. In addition, Hur, Raj and Riyanto (2006), by extending the model to consider the impact of the interplay between financial development and an industry's asset structure (i.e., asset tangibility) on international trade, demonstrate that a higher level of financial development is associated with more exports in industries with more intangible assets. Furthermore, Manova (2008), in examining the impact of equity market liberalization on the trade pattern, provides empirical evidence to support the view that liberalizations increase exports disproportionately more in financially vulnerable sectors that require more external financing or employ fewer tangible assets.

Overall, most of the previous empirical studies have used the relative *size* of the financial sector to GDP as a proxy for financial development to investigate its impact on international trade. Recently, some studies have been extended to consider the impacts of other financial features on real economic variables. For instance, the financial development process entails a deepening of markets and services that channel savings to productive investments, allow risk diversification and thus possibly lead to higher growth in production. However, the

[1] On balance, this line of research concludes that the depth of financial markets and institutions, usually measured by the size of private credit relative to GDP, exerts a positive and significant effect on long-run growth. Further efforts have also been made toward establishing that the direction of causality is effectively from financial development to economic growth, but not the other way around, based on analyzing industry- and firm-level data to clarify the mechanisms that are somewhat obscured in cross-country studies (Demirgüç-Kunt and Maksimovic, 2002; Rajan and Zingales, 1998). Please see Levine (2005) and Ang (2008) for complete surveys on this issue.

same process can also present weaknesses evidenced by systemic banking crises, cycles of booms and busts, and universal financial sector volatility. Whether intrinsic to the process of development or induced by policy mistakes or external shocks, these elements of financial sector volatility (or instability) can also affect the real activities, such as the production or exports, of a country, e.g., Loayza and Rancière (2006), Kim, Lin and Suen (2010) and Lin and Huang (2012). In addition, other financial characteristics, such as the banking market structure, can affect the efficiency of the production of services, the quality of products, the degree of innovation in that sector and the access of firms to external financing, thereby exerting some effects on real variables, e.g., Cetorelli and Gambera (2001) and Claessens and Laeven (2005). Nevertheless, the literature has so far not paid much attention to examining the impacts of financial sector volatility and banking market structure on exports. As such, this paper intends to contribute to the finance-trade-nexus literature by further assessing the impacts of these alternative financial features on the pattern of industrial exports.

But via what mechanism can financial sector volatility possibly affect export flows? According to Mishkin (1999), there are four categories of fundamental factors that lead to financial instability: an increase in interest rates due to monetary policy, increases in uncertainty due to recessions or political instability, an asset market effect on nonfinancial firms' balance sheets, and problems in the banking sector due to a deterioration in the banks' balance sheets. In general, the situation of asymmetric information between lender and borrower leads to two basic problems in the financial system: adverse selection and moral hazard. Particularly, higher interest rates and rising uncertainty can worsen the problems of adverse selection and moral hazard, and hence drive up the possibility of lending to bad credits. Under these circumstances, lenders will be reluctant to make more loans, which may lead to a sharp decline in lending that will result in substantially lower investment of exporters and then their exports. In addition, the decrease in net worth resulting from a stock market decline makes lenders less willing to lend because the net worth of firms has a similar role to collateral, and when the value of collateral declines, it provides less protection to lenders so that losses from loans are likely to be more severe. Regarding the problems in the banking sector, banks are important in financial markets since they are well suited to engaging in information-producing activities that facilitate productive investment for the economy. Thus, a deterioration in the ability of banks to engage as

financial intermediaries and make loans will directly lead to a decline in investment and hence real economic activity such as production and exports.

As to the impact of banking market structure on real activity, several theories have shown that the degree of competition in the financial sector has a nontrivial impact on the access of firms to external financing and hence on the process of capital accumulation. However, the direction of this relationship is still theoretically unclear (see Vives 2001 for a review). On the positive side, less competitive systems may lead to easier access to external financing because banks are more inclined to invest in information acquisition and relationships with borrowers when banks have more market power. For instance, Mayer (1988, 1990) and Petersen and Rajan (1995) highlight this potential incompatibility between bank competition and the establishment of close lending relationships. By contrast, holdup problems may lead borrowers to be less willing to enter into such relationships, thereby lowering the effective demand of external financing. In addition, a less-competitive banking system can make financial services more costly or of lower quality, thereby reducing the effective demand for external financing and hence discouraging real activities, such as production and exports. Pagano (1993), for example, shows this effect in an endogenous growth model. Accordingly, the linkage between banking market structure and production as well as exports remains an empirical issue.

From the previous analysis, one can see that financial instability occurs when shocks to the financial system interfere with information flows in that the financial system can no longer do its job of channeling funds to those with productive investment opportunities and hence may possibly result in a contraction of output and exports. In addition, the market structure in the banking sector not only affects the efficiency of the production of services and the quality of products in that sector, but also influences the access of firms to external financing, although the direction of this relationship is theoretically ambiguous, and thus possibly affects real activities such as production and exports. In general, these effects should be especially important for those firms (or industries) with higher external financial dependence. As such, in this paper, we will use an extended model of Rajan and Zingales (1998, hereafter RZ) to empirically investigate the issue of how a country's degree of volatility and market structure in the financial sector will affect the trade flows of industries with different levels of external financial dependence. In RZ's framework,

one way to check whether a channel is at work is to see whether industries that might be most affected by a channel, such as external finance, will have a comparative advantage in relation to exports (more or less depending on the nature of the effect) in countries where that channel is likely to be more operative. As such, concern with the causality problem, which is usually a concern in cross-country studies, can be greatly allayed through this mechanism. [2] Furthermore, we will use the instrumental variable technique to deal with the econometric shortcomings present in the finance and growth literature due to endogeneity problems.

By briefly foreshadowing our main results, firstly, our empirical analysis reveals that when adding the interactions among other financial characteristics, such as financial sector volatility and banking market structure, to the original RZ specification, the positive effect of financial development on sectoral exports, via the channel of external financing, is attenuated. Secondly, financial sector volatility does exert an independent, significantly negative impact on the exports of those industries depending more on external finance. Thirdly, the test on the effect of banking market structure shows that a more concentrated banking system has an expanding effect on the relative export shares of sectors with higher external funding needs. As such, our results show that a more stable and less competitive banking sector is beneficial to exports, especially for those industries relying more upon external financing, and this finding is robustly confirmed by a variety of kinds of sensitivity analyses.

The rest of this paper is structured as follows. Section 2 presents our empirical models, which augment the difference-in-difference methodology introduced by Rajan and Zingales (1998). Section 3 explains the data sources and the construction of relevant variables. Section 4 presents our main results. Section 5 provides some robustness checks. Lastly, Section 6 concludes.

[2] RZ's approach has been widely applied to assess the effect of trade credit usage on sectoral growth (Fisman and Love, 2003), to investigate the impact of financial development on small firms (Beck et al., 2008), to examine the role of institutional quality in international trade (Levchenko, 2007), and to test the impacts of aid on the growth of manufacturing (Rajan and Subramanian, 2011), just to name a few.

## 2 Empirical strategy

To precisely identify the impacts of financial sector volatility and financial market structure on export performance, our empirical strategy has to carefully deal with the issues of reverse causality and endogeneity. For instance, it is likely that the shocks that trigger financial sector volatility can also affect export performance. In addition, the performance of exports can be the source of financial sector volatility, and such reverse causality may be of particular concern in countries that are not well diversified and thus heavily rely on a few industries. In this case, if loans to those exporters are sufficiently high in the portfolios of the banks, then demand-side shocks that lead to fluctuations in export performance can be transformed into financial sector volatility due to the inability of the exporters to pay off their loans. To cope with these concerns, we employ the difference-in-difference approach of Rajan and Zingales (1998) to mitigate, if not eliminate, these concerns.

In their seminal paper, Rajan and Zingales (1998) suggest that one way to check whether a channel is at work is to see whether industries that might be most affected by a channel grow differentially (more quickly or more slowly depending on the nature of the effect) in countries where that channel is likely to be more operative. As such, the concern with the causality problem can be greatly mitigated through this mechanism. Since we are interested in the differential effects of financial sector volatility and financial market structure on the industrial export performances of different countries, we extend the RZ model by respectively adding two interaction terms of a measure of external finance with measures of financial sector volatility and banking market structure to examine whether financial sector volatility and banking market structure respectively have a disproportionately larger effect on the relative exports of sectors with different degrees of external financial dependence. As such, our benchmark regression is specified as follows,

$$\begin{aligned} Export_{i,k} \quad = \quad & \sum_k \alpha_k Country_k + \sum_i \beta_i Industry_i \\ & + \delta_1 (External\ finance_i \times Financial\ development_k) \\ & + \delta_2 (External\ finance_i \times Financial\ sector\ volatility_k) \\ & + \delta_3 (External\ finance_i \times Banking\ market\ structure_k) \\ & + \sum_m \theta_m Other\ controls_{m,i,k} \end{aligned}$$

$$+\epsilon_{i,k} \quad (1)$$

where subscripts $i$ and $k$ denote the $i$th industry and the $k$th country, respectively. The dependent variable is the ratio of exports to GDP in industry $i$ located in country $k$, over the 1980-1997 period. Moreover, $Country_k$ and $Industry_i$ are, respectively, the country and industry dummies used to capture the country- and industry-specific effects. By including these dummy variables, the problems of omitted variable bias or model specification, which are common to cross-country regressions, can be significantly mitigated.

The interaction of *External finance*$_i$ (the measure of external financial dependence of the $i$th industry) and *Financial development*$_k$ (the indicator of financial development of the $k$th country) is included to examine whether financial development exerts a causal effect in stimulating industrial exports through the channel of external financing, as several previous studies have tested. In addition, the interaction terms of *External finance*$_i$ respectively with *Financial sector volatility*$_k$ (the indicator of the financial sector volatility of the $k$th country) and *Banking market structure*$_k$ (the indicator of the banking market structure of the $k$th country), which are our main interest, are incorporated to test whether the exports of those sectors that are more externally financially dependent are more vulnerable in countries where the financial sector is more volatile and more competitive. As such, we are particularly interested in the sign and statistical significance of the parameters $\delta_2$ and $\delta_3$. In addition, to substantiate our empirical results, we also further control for the interaction of other factor endowments with industry intensity, which is commonly suggested by the previous literature, as indicated by '*Other controls*' in equation (1). As such, we examine whether the impacts of financial sector volatility and banking market structure on the exports of industries with different degrees of external financial dependence are sensitive to the control of interactions between industry intensity and country-level endowments, which include physical capital, human capital, and natural resources. Finally, $\epsilon_{i,k}$ is the error term.

Moreover, some studies have indicated that a firm's asset structure may be closely related to financial development. For instance, Braun (2003) shows that, in countries with lower levels of financial development, industries with more tangible assets are relatively large and grow faster than those with more intangible assets. Recently, this hypothesis has been extended by Hur, Raj and Riyanto (2006) and Manova (2008) to test the impact of

the interaction of asset tangibility and financial development on trade patterns. Based on this line of the literature, we extend our benchmark model by including three additional interaction terms, i.e., $Tangibility_i$, which respectively interact with $Financial\ development_k$, $Financial\ sector\ volatility_k$ and $banking\ market\ structure_k$ to account for the impact of the financial sector on the exports of the industries with more tangible assets. Specifically, the regression is specified as,

$$\begin{aligned} Export_{i,k} \quad = \quad & \sum_k \alpha_k Country_k + \sum_i \beta_i Industry_i \\ & + \delta_1 (External\ finance_i \times Financial\ development_k) \\ & + \delta_2 (External\ finance_i \times Financial\ sector\ volatility_k) \\ & + \delta_3 (External\ finance_i \times Banking\ market\ structure_k) \\ & + \gamma_1 (Tangibility_i \times Financial\ development_k) \\ & + \gamma_2 (Tangibility_i \times Financial\ sector\ volatility_k) \\ & + \gamma_3 (Tangibility_i \times Banking\ market\ structure_k) \\ & + \sum_m \theta_m Other\ controls_{m,i,k} \\ & + \epsilon_{i,k} \end{aligned} \tag{2}$$

where $\gamma_1$, $\gamma_2$ and $\gamma_3$ respectively represent the impacts of the interaction between industrial asset structure and financial development, financial sector volatility, and banking market structure on industrial exports. By means of this augmented regression, we can further test for the robustness of our finding obtained from the benchmark regression. Furthermore, to make our results more robust, we will perform instrumental variable techniques on Equations (1) and (2) to deal with the endogeneity problem.

# 3 Data Sources and Description

Basically, the industry-specific and country-specific data used in this study are mainly gathered from Manova (2008) and Braun (2003), and complemented by the Financial Development and Structure Database constructed and recently updated by Beck, Demirgüç-Kunt and Levine (2000, 2010). Ultimately, the full sample contains 63 countries and 27 industries. In this section, we will briefly describe the construction of the relevant variables and their original sources. For ease of illustration, these variables are categorized into

country-industry-specific, industry-specific and country-specific variables, respectively.

Regarding the country-industry-specific variable, following Beck (2003), we define the dependent variable as the share of an industry's exports in GDP (`Export share`) for all regressions. The annual export flows of 3-digit ISIC industries, which are originally at the 4-digit SITC Rev.2 industry level from Feenstra's World Trade Database, are taken from Manova (2008) for the 1980-1997 period. Furthermore, they are deflated by export price indices obtained from the World Development Indicators (WDI) of the World Bank. To obtain the share of industry exports in GDP, we divide the deflated exports by real GDP, using WDI data. Finally, the shares are averaged over the 1980-1997 period. Furthermore, two alternative measures of international trade, i.e., the net export share and the Balassa index (Balassa, 1986), are additionally employed to check for the robustness of our main results. [3]

As the industry-level data for most countries are very limited, the industry-specific variables are usually constructed from the industry data of a benchmark country, which is usually the US for its data quality. [4] First of all, to assess the impact of the financial sector on industrial exports, an important mechanism concerns industrial reliance on external funds. As such, for the 27 3-digit ISIC sectors in this study, industry-level measures of external financial dependence (`External finance`), which is defined as the difference between industry investment and industry cash flow relative to industry investment, are obtained from Rajan and Zingales (1998), who use US data from COMPUSTAT at the three-digit ISIC level for the 1980-1989 period.

Recently, several works, such as Hur, Raj and Riyanto (2006) and Manova (2008), have extended the model to show that the pattern of financing is crucially influenced by the nature of investable assets. Harder or more tangible assets can protect financiers against

[3]The net export share is defined as the ratio of the trade balance to GDP (i.e., net exports/GDP) in industry $i$ of country $k$ over the period 1980-1997, while the Balassa index, which is also known as the Revealed Comparative Advantage (RCA), is defined as $1 + \frac{X_{i,k}-M_{i,k}}{X_{i,k}+M_{i,k}}$, where $X_{i,k}$ is the real exports of industry $i$ of country $k$, while $M_{i,k}$ is the real imports of industry $i$ of country $k$. Note that the former measure is weighted by real GDP, while the Balassa index is weighted by the total real trade. Again, the mean values of these two measures are obtained for the 1980-1997 period.

[4]Other reasons for using US data to construct industry measures include: (1) the US is characterized by one of the most advanced and sophisticated financial systems, which makes it reasonable to believe that the measures reflect the firms' true demand for external capital and tangible assets; (2) using the US as the reference country is convenient because of the limited data for many other economies, but it also eliminates the potential for the measures to endogenously respond to the availability of external finance within a country.

possible debtors' default because the collateral value of these assets and the ability of financiers to liquidate these assets act as a cushion against the adverse impact of the agency problem. As such, the interplay between the financial sector and the pattern of the industrial asset structure on the export pattern is also considered. Asset tangibility (`Tangibility`) is defined as the share of net property, plant and equipment in total book-value assets for the median firm in a sector and then averaged for the 1986-1995 period. The industry-level data on tangibility, originally provided by Braun (2003), are also obtained from Manova (2008).

Moreover, other industry characteristics are also controlled in our empirical analysis. The first indicator is human capital intensity (`Human capital intensity`), which is the median from 1986 to 1995 of the industry's mean wage over that for the US manufacturing sector as a whole. The second indicator is physical capital intensity (`Physical capital intensity`) measured as the median of the ratio of gross fixed capital formation to value added in the United States for the 1986-1995 period in each industry. Finally, natural resource intensity (`Resource intensity`) is a dummy variable that takes a value of 1 for the following industries (and 0 otherwise): wood products, except for furniture; paper and products; petroleum refineries; miscellaneous petroleum and coal products; other nonmetallic mineral products; iron and steel; and nonferrous metals. All these sectoral intensities with respect to human capital, physical capital and natural resources are taken from Braun (2003).

In what follows, we will introduce the country-specific variables. In this study, we use three types of measures to describe the degrees of development, stability and competition in the financial sector and the further influence of these different aspects of the financial sector on industrial exports. The original data source used to measure these financial indices is from Beck, Demirgüç-Kunt and Levine (2000, 2010). First of all, to describe the development of the financial sector, our primary indicator is '`Private credit`', which is measured by the domestic credit to the private sector relative to GDP in 1980. In addition, for later sensitivity analysis, we further consider two alternative measures of financial intermediary development. One is '`Bank assets`', which is measured by the deposit money banks' domestic assets divided by GDP, and the other is '`Liquid liabilities`', which equals the liquid liabilities of the financial system (currency plus demand and interest-bearing

liabilities of banks and nonbank financial intermediaries) divided by GDP.

To capture the degree of stability (or volatility) in the financial sector, alternative indices of financial sector volatility that correspond to different indices of financial development are measured. For instance, corresponding to the primary indicator of financial development, i.e., '`Private credit`', financial sector volatility is measured by the standard deviation of the growth of the private credit by deposit money banks and other financial institutions relative to GDP (`Volatility of private credit`), over the 1980-1997 period. Similarly, alternative financial sector volatility indices corresponding to the other two indices of alternative financial development, i.e., '`Bank assets`' and '`Liquid liabilities`', are measured as the standard deviation of the growth of deposit money bank assets over GDP and liquid liabilities over GDP, respectively, over the 1980-1997 period.

As to the measure of the banking market structure, which usually represents the degree of competition in the financial sector, we use '`Bank concentration`', which is measured by the share of the three largest banks' assets over all commercial banks averaged over the period 1989-1997. For a later robustness check, we also adopt other indices of competition from previous studies, which include: (1) a concentration variable measured as the market share of the three largest banks in each country from Schaeck, Cihak, and Wolfe (2009); (2) an alternative bank-market concentration indicator measured as the fraction of bank assets held by the three largest commercial banks in a country from González (2009); and (3) the $H$-statistic, which measures the degree of competition by using Panzar and Rosse's (1987) approach, and is obtained from Bikker and Spierdijk (2008). For the bank concentration indices, the value is between 0 and 1, with a higher value denoting the more dominant market power of the three largest banks in a country. As to the $H$-statistics, a monopoly case is represented by $H \leq 0$, while monopolistic competition is shown with $0 < H \leq 1$ and perfect competition is denoted by $H = 1$. As such, the higher value of the $H$-statistics indicates that the banking sector is more competitive.

Furthermore, other country-level characteristics, which interact with the previously mentioned industry characteristics, are also controlled for in our empirical model. These include country-level human capital (`Human capital level`), which is calculated from the average years of schooling in a country with Mincerian non-linear returns to education, and the stock of physical capital per capita (`Physical capital level`), which is con-

structed according to the perpetual inventory method. Both measures originated from Caselli (2005). The indicator for the natural resource endowment (`Natural Resource Stock`) is taken from the World Bank's *Expanding the Measure of Wealth* publication, Chapter 3. The World Bank appraises countries' endowments of minerals and fossil fuels, timber, non-timber forests, cropland and pastureland and the natural resource stock at the country level is measured as the log of the aggregate natural resource endowment per capita. All these data are directly obtained from Manova (2008).

Table 1 provides the summary statistics for some of the relevant variables, and Table 2 displays detailed (country-level) figures of the preferred measures of financial development (`Private credit`), the corresponding measure of volatility (`Volatility of private credit`) and the primary indicator of market structure in the banking sector (`Bank concentration`).

# 4 Empirical Results

## 4.1 Benchmark Results

Panel A of Table 3 reports the unconditional effects of financial development, financial sector volatility, and banking market structure on the exports of industries with alternative degrees of external financial dependence. These results are obtained by regressing the industrial export share on the interaction terms between industrial external financial dependence (`External finance`) and country-level financial development (`Private credit`), financial sector volatility (`Volatility of private credit`), and banking market structure (`Bank concentration`), respectively. Country and industry dummies are also included to control for unobserved country-specific and industry-specific effects. All these regressions are estimated using the instrumental variables (IV) technique, where the legal origins of the country are used as instruments for financial development or financial sector volatility, to reduce concerns regarding endogeneity and measurement error. [5] In addition, Hansen $J$ statistics are provided to verify the existence of the over-identification problem.

[5]Previous studies have indicated that the legal origin of a country materially influences its legal treatment of creditors and shareholders, its accounting standards, and the efficiency of contract enforcement, and thus the efficiency of financial intermediaries and markets (La Porta et al., 1997, 1998; Levine, 1998). In some cases, additional instruments, such as the distribution of religion within a country measured as the shares of Catholic, Muslim and Protestant population in total population, are included if needed.

For comparison purposes, we start by replicating the work of Beck (2003) by only considering the interaction of '`External finance`' and '`Private credit`' to investigate whether industries that are more dependent on external finance export more in countries with better developed financial markets. By focusing on column (1) of Table 3, the estimated coefficient for the financial interaction term is 0.976 and is statistically significant at the 1% level, thus verifying the results of Beck (2003) that countries with better developed financial institutions and markets have a comparative advantage in industries that rely more on external finance.

To further examine the effect of financial sector volatility on industrial exports, which is one of our main interests, we then proceed to substitute the interaction term in column (1) with alternative interaction term for '`External finance`' and '`Volatility of private credit`' first, and the estimate result is reported in column (2) of Table 3. It can be seen that the estimated coefficient for the interaction term of '`External finance`' and '`Volatility of private credit`' is negative ($-1.390$) and statistically significant at the 1% level, thereby indicating that financial sector volatility is detrimental to the relative exports of sectors relying more on external funds. Next, we then add this alternative interaction term to regression reported in column (1). The estimate outcome presented in column (3) of Table 3 shows that the positive impact of bank development on industrial exports is no longer statistically significant. Instead, the estimated coefficient for the interaction term of '`External finance`' and '`Volatility of private credit`' still negative ($-1.548$) and statistically significant at the 1% level, hence once again lending strong support to the notation that financial sector volatility is harmful to the exports of sectors that are more externally financially dependent.

Furthermore, to assess the differential effect of banking market structure on industrial exports, we proceed to add additional interaction of '`External finance`' and '`Bank concentration`' to regressions reported in columns (2) and (3). As shown in columns (4) and (5) of Table 3, with this additional interaction term, the estimated effects of financial development and financial sector volatility through external financial dependence on industrial exports are qualitatively similar to those reported in columns (2) and (3). However, the estimated coefficients of this additional banking market structure interaction are all positive (1.812 and 1.806, respectively) and statistically significant at the 1% level, thus

providing evidence that higher bank concentration has a beneficial effect on industries more in need of external finance, and pointing out the importance of the banking system with more market power to acquire information and relationships with borrowers.

Taken together, the empirical evidence from our unconditional regressions firstly shows that the detrimental effect of a more volatile banking system will lead to a relatively greater reduction in the exports of industries relying more on external funds, for firms in these industries are more vulnerable in that they require external funds to finance their investments to expand their exports, as the problems of adverse selection and moral hazard become more severe when the financial sector is volatile. Secondly, the outcomes from our baseline regressions also demonstrate that a more concentrated banking sector is beneficial to the relative exports of industries more in need of external finance, thus supporting the hypothesis that banks with more market power have a greater incentive to establish lending relationships with their client firms, and hence can facilitate their access to credit lines for export expansion.

However, the impact of financial development, measured as the share of domestic private credit to GDP, on exports is attenuated as financial sector volatility and banking market structure are considered. This finding may due to high correlation between volatility and private credit. To verify this possibility, we examine the correlation coefficient between these two variables and find it is $-0.4397$, which shows that these two variables may have something in common to explain the variation of industrial exports. However, from the results presented in columns (2) to (5) of Table 3, one can see that the explanatory power of financial volatility is larger in magnitude and more stable across alternative specifications. This finding may econometrically imply that previous studies on the finance-growth nexus without considering other aspects of financial development could suffer an omitted-variable-bias problem. On the other hand, this outcome could also economically suggest that the predictability of financial development measured as *size* on industrial trade may be weakened as the other features of the financial sector, such as stability and market power, are considered. As such, our results point out the importance of considering the impacts of different features (volatility and structure) of the financial sector on industrial exports.

Furthermore, Panel B of Table 3 presents the conditional effects of financial characteristics on industrial exports by controlling for other determinants that are likely to influence

international trade patterns. First of all, we consider other factor endowments that might affect trade patterns as commonly suggested in the standard trade theories. Technically, this is done by adding the interaction terms of factor endowments, including physical capital, human capital and natural resources, in country $k$ with factor intensity, i.e., physical capital intensity, human capital intensity and resource intensity, corresponding to industry $i$. As can be seen that the estimate result reported in column (6) of Table 3 shows the robustness of the estimated coefficients, and we pay particular attention to the effects of financial sector volatility and bank concentration on sectoral exports. As the evidence clearly shows, our key finding of the diminishing effect of financial sector volatility and the enhancing effect of bank concentration on export patterns, especially for those industries relying more on external finance, still hold even with various determinants of the export pattern being simultaneously controlled. Thus, the sensitivity test of adding other determinants of the export pattern has strongly supported our unconditional results.

Secondly, several recent studies have indicated that a firm's asset structure may be closely related to financial development, e.g., Braun (2003), Hur, Raj and Riyanto (2006) and Manova (2008). [6] To account for this concern, we extend the unconditional model by including three additional interaction terms, i.e., '`Tangibility`' respectively interacts with '`Private credit`', '`Volatility of private credit`', and '`Bank concentration`', and the estimation results are reported in column (7) of Table 3. As can be seen, the negative effect of financial sector volatility and the positive impact of bank concentration on the relative exports of industries with higher external dependence continue to hold, even with additional consideration of asset tangibility as an alternative channel through which the efficiency of the financial sector can affect the export patterns. As to the impact of financial characteristics via asset tangibility on industry exports, we find that only the interaction of financial sector volatility with asset tangibility has a statistically significant positive effect on the relative exports of sectors with more tangible assets. This finding is also robustly confirmed by additionally controlling for other interactions of factor endowments with the

[6]The intuition for this postulation is that firms located in a country with an under-developed financial market require tangible assets to gain access to external financing, due to the moral hazard and adverse selection problems between lenders and borrowing firms tending to be more severe in countries with less-developed financial sectors. As the risk of default increases, tangible assets can be collateralized and thus provide protection for creditors against the risk of default. As such, the role of collateralized tangible assets becomes more prominent in countries with an underdeveloped financial market than in countries with a better developed financial market.

corresponding intensity of each industry, with results reported in columns (8) of Table 3. Overall, these outcomes indicate that as the uncertainty caused by financial instability increases, a higher ability to provide collateral might ease access to finance when confidence in the economy is low, and hence might benefit the exports of those industries with more tangible assets.

# 5 Robustness Check

In this section, we perform a battery of experiments to check the robustness of our main finding, i.e., financial sector volatility is detrimental while bank concentration is beneficial to exports for those industries that are more externally financially dependent. First of all, to check for the sensitivity of our main results to alternative measures of international trade, we re-estimate the unconditional and conditional specifications of Equation (1), using the Balassa index and net export share as our alternative dependent variables. The estimation results are reported in Table 4, with the odd columns presenting the unconditional models and even columns displaying the conditional models with factor endowments simultaneously controlled. First focusing on the results for the Balassa index, we find that the coefficients for the interaction terms of '`External finance`' and '`Volatility of bank development`' are negative, while those for the interaction between '`External finance`' and '`Bank concentration`' are positive, with all the coefficients for these variables of interest being statistically significant at least at the 5% level or better, thus lending more support to our previous finding that financial sector volatility and a more concentrated banking system respectively exert negative and positive impacts on the comparative advantage of industries that rely more on external finance. However, when looking at the result with the dependent variable replaced by the net export share, we find that the negative impact of financial volatility on trade still holds, but the beneficial effect of a more concentrated banking structure on trade is weakened and turns out to be statistically insignificant. Nevertheless, the outcomes based on the Balassa index provide further evidence supporting the view that financial volatility is harmful, while the concentrated banking system is beneficial, relatively speaking, to industries that rely more on external financing.

Secondly, we consider three alternative proxies of financial sector volatility: (i) the range

of the growth of private credit by deposit money banks and other financial institutions over GDP `Private credit`, (ii) the standard deviation of the growth of deposit money bank assets over GDP (`Bank assets`), and (iii) the standard deviation of the growth of liquid liabilities over GDP (`Liquid liabilities`) respectively, over the 1980-1997 period. The coefficient estimates are reported in Table 5, again with odd columns representing the unconditional models and even columns representing the models with factor endowments simultaneously controlled. Generally speaking, the results show that all the coefficients for the interaction between '`External finance`' and the '`Volatility of bank development`' are negative in nature and statistically significant at the 10% level or less across regressions. This outcome demonstrates that, even with distinct indicators of financial sector volatility, financial sector volatility continues to exert a negative impact on the exports of industries with higher external financial dependence. On the other hand, the beneficial effect of bank concentration persists in all different specifications. Consequently, the results from this sensitivity test have demonstrated that the detrimental effect of financial sector volatility on industry exports is unlikely to be driven by the particular indicator of volatility of financial development (`Private credit`) used.

Lastly, to cope with the possibility that the beneficial effect of a less competitive financial market could be dependent on the specific measure of bank concentration used in our benchmark regression, we experiment with different measures of market structure used in previous studies, which include: (1) a concentration variable (`Conc-SCW`) measured as the market share of the three largest banks in each country from Schaeck, Cihak, and Wolfe (2009), (2) an alternative bank-market concentration variable (`Conc-G`) measured as the fraction of bank assets held by the three largest commercial banks in a country from González (2009), and (3) the $H$-statistic (`H-BS`), which measures the degree of competition by using Panzar and Rosse's (1987) methodology, from Bikker and Spierdijk (2008). The results are displayed in Table 6. It can be seen that when the bank concentration indices are applied, the coefficients for the interaction of industrial '`External finance`' and country-level '`Banking market structure`' are all positive and statistically significant at the 5% level or less, thus suggesting that a less competitive financial market exerts a positive impact on sectoral exports via the channel of external financing. In addition, when the market structure is measured as the $H$-statistic, in which a higher value indicates more

competitiveness in the financial sector, we find that the estimated coefficients for the interaction of '`External finance`' and '`Banking market structure`' are negative as shown in columns (5) and (6) in Table 6. The results indicate that a less competitive financial sector is beneficial to industrial exports, and thus supplement the results from the model using bank concentration as a proxy for banking market structure. In addition, the detrimental effect of financial sector volatility is still robust across different specifications. Accordingly, our main finding of a beneficial (detrimental) effect of a less competitive (stable) financial sector on industrial exports is again strongly confirmed.

A further question that can be raised here is: will the impact of banking industry structure on trade be different in the developed and developing countries? To address this issue, we divide our sample into developed and developing countries, and then re-run the regressions for the unconditional and conditional specifications of Equation (1). [7] As can be seen in Table 7, there exist differential impacts of banking industry structure on industrial trade in the developed and developing country groups. For instance, the influence of the market power in the banking sector on industrial trade is trivial and statistically insignificant in the developed countries, yet the more concentrated banking sector continues to exert positive impacts on the exports of industries that rely more on external finance in the developing countries. This result suggests that the hypothesis that banks with more market power have a greater incentive to establish lending relationships with their client firms, and hence can facilitate their access to credit lines for export expansion, may be true in the developing countries, but may not be so in the developed counterparts. Alternatively, this result may also be due to the reason that, in the developing countries, it is easier for the government to rule over the more concentrated banking system to subsidize exporters, and thus make those industries depending more on external finance export more. [8] As such, the effects of banking industry structure on industrial trade can be quite different in the developed and developing countries.

[7]The developed countries are defined as those countries that joined the OECD before 1980, and include Australia, Austria, Canada, Switzerland, Denmark, Spain, Finland, France, the United Kingdom, Greece, Ireland, Italy, Japan, the Netherlands, Norway, Portugal, Sweden, and Turkey. The rest of the countries listed in Table 2 are grouped as developing countries.

[8]We are grateful to one referee for pointing out this possibility and interpretation to us.

# 6 Conclusion

As a supplement to the extant literature that studies the relationship between financial development and real activity, this paper further investigates the impact of other features of the financial sector, such as financial sector volatility and banking market structure, on industrial exports. For that purpose, we extend the framework of Rajan and Zingales (1998) by additionally considering interaction terms of industrial reliance on external funds respectively with measures of country-level financial sector volatility and banking market structure. The data used are mainly taken from Manova (2008), and are complemented by the Financial Development and Structure Database of Beck, Demirgüç-Kunt and Levine (2000, 2010).

Our benchmark result shows that the positive effect of financial development on sectoral exports via the channel of sectoral external financing is attenuated when other features of the financial sector are considered. This may econometrically imply that previous studies on the finance-growth nexus not including other aspects of the financial sector could suffer from an omitted-variable-bias problem and economically suggest that the predictability of financial development measured as *size* on industrial trade may be weakened as the other features of the financial sector are considered. Most importantly in accordance with our purpose, financial sector volatility, measured as the standard deviation of the growth of private credit, and banking market structure, measured as the share of the three largest banks' assets to the assets of all commercial banks, respectively have significantly negative and positive impacts on the exports of industries that rely more on external funds. In other words, this result implies that financial sector volatility has a detrimental effect, while a market with a less competitive banking structure has a beneficial impact on industrial exports. This finding is robust to various determinants of exports controlled, asset tangibility additionally considered, different measures of international trade applied, alternative indicators of financial sector volatility employed, and various measures of banking market structure used. Consequently, the major message emerging from our research is that a more stable and concentrated financial sector is favorable to industrial exports, especially for those sectors that depend more on external finance.

# Acknowledgements

We are grateful to Kalina Manova for making publicly available the data used in this article. We also thank Zhihong Yu (the editor), an anonymous referee, Shiu-Sheng Chen and seminar participants at 2012 Macroeconometric Modelling Workshop in Academic Sinica for very helpful comments and suggestions. The second author would also like to take this opportunity to acknowledge the financial support received from the National Science Council (Taiwan, ROC.) via grant number `NSC 97-2410-H-032-002-MY3`. Any remaining errors are our own.

# References


Ang, J. B. (2008), "A Survey of Recent Developments in the Literature of Finance and Growth." *Journal of Economic Surveys* 22, 536-576.

Balassa, B. (1986), "Comparative Advantage in Manufactured Goods." *Review of Economics and Statistics* 84, 342-352.

Baldwin, R. E. (1989), "Exporting the Capital Markets: Comparative Advantage and Capital Market Imperfections." in D. B. Audretsch, L. Sleuwaegen, and H. Yamawaki eds., *The Convergence of International and Domestic Markets*, 135-152. Amsterdam: North-Holland.

Beck, T. (2002), "Financial Development and International Trade. Is There a Link?" *Journal of International Economics* 57, 107-131.

Beck, T. (2003), "Financial Dependence and International Trade." *Review of International Economics* 11,107-131.

Beck, T., Demirgüç-Kunt, A., Laeven, L., and Levine, R. (2008), "Finance, Firm Size, and Growth." *Journal of Money, Credit and Banking* 40, 1379-1405.

Beck, T., Demirgüç-Kunt, A., and Levine, R. (2000), "A New Database on the Structure and Development of the Financial Sector." *World Bank Economic Review* 14, 597-605.

Beck, T., Demirgüç-Kunt, A., and Levine, R. (2010), "Financial Institutions and Markets across Countries and over Time: The Updated Financial Development and Structure Database." *World Bank Economic Review* 24, 77-92.

Bikker, J. A. and Spierdijk, L. (2008), "How Banking Competition Changed over Time." De Nederlandsche Bank working paper No.167.

Braun, M. (2003), "Financial Contractibility and Asset Hardness." University of California-Los Angeles mimeo.

Caselli, F. (2005), "Accounting for Cross-Country Income Differences." In: P. Aghion, S. Durlauf, eds., *Handbook of Economic Growth*, Vol. 1A, 681-741. Elsevier, Amsterdam.

Cetorelli, N. and Gambera, M. (2001), "Banking Market Structure, Financial Dependence and Growth: International Evidence from Industry Data." *Journal of Finance* 56, 617-648.

Claessens, S. and Laeven, L. (2005), "Financial Dependence, Banking Sector Competition, and Economic Growth." *Journal of the European Economic Association* 3, 179-207.

Demirgüç-Kunt, A. and Maksimovic, V. (2002), "Funding Growth in Bank-Based and Market-Based Financial Systems: Evidence from Firm Level Data." *Journal of Financial Economics* 65, 337-363.

Fisman, R. and Love, I. (2003), "Trade Credit, Financial Intermediary Development, and Industry Growth." *Journal of Finance* 58, 353-374.

González, F. (2009), "Determinants of Bank-Market Structure: Efficiency and Political Economy Variables." *Journal of Money, Credit and Banking* 41, 735-754.

Hur, J., Raj, M., and Riyanto, Y. E. (2006), "Finance and Trade: A Cross-Country Empirical Analysis on the Impact of Financial Development and Asset Tangibility on International Trade." *World Development* 34, 1728-1741.

Kim, D. H., Lin, S. C., and Suen, Y. B. (2010), "Are Financial Development and Trade Openness Complements or Substitutes?" *Southern Economic Journal* 76, 827-845.

King, R. G. and Levine, R. (1993a), "Finance, Entrepreneurships, and Growth: Theory and Evidence." *Journal of Monetary Economics* 32, 513-542.

King, R. G. and Levine, R. (1993b), "Finance and Growth: Schumpeter Might Be Right." *Quarterly Journal of Economics* 108, 717-737.

Kletzer, K. and Bardhan, P. K. (1987), "Credit Markets and Patterns of International Trade." *Journal of Development Economics* 27, 57-70.

La Porta, R., Lopez-de-Silanes, F., Shleifer, A., and Vishny R. W. (1997), "Legal Determinants of External Finance." *Journal of Finance* 52, 1131-1150.

La Porta, R., Lopez-de-Silanes, F., Shleifer, A., and Vishny R. W. (1998), "Law and Finance." *Journal of Political Economy* 106, 1113-1155.

Levchenko, A. A. (2007), "Institutional Quality and International Trade." *Review of Economic Studies* 74, 791-819.

Levine, R. (1998), "The Legal Environment, Banks, and Long-Run Economic Growth." *Journal of Money, Credit and Banking* 30, 596-613.

Levine, R. (2005), "Finance and Growth: Theory and Evidence." In P. Aghion and S. N. Durlauf, eds., *Handbook of Economic Growth*, Vol. 1A, 865-934. Elsevier, Amsterdam.

Lin, P.C. and Huang, H. C. (River) (2012), "Banking Industry Volatility and Growth." *Journal of Macroeconomics* 34, 1007-1019.

Loayza, N. V. and Rancière, R. (2006), "Financial Development, Financial Fragility, and Growth." *Journal of Money, Credit and Banking* 38, 1051-1076.

Manova, K. (2008), "Credit Constraints, Equity Market Liberalizations and International Trade." *Journal of International Economics* 76, 33-47.

Mayer, C. (1988), "New Issues in Corporate Finance." *European Economic Review* 32, 1167-1183.

Mayer, C. (1990), "Financial Systems, Corporate Finance and Economic Development." In R. G. Hubbard, ed., *Asymmetric Information, Corporate Finance and Investment*. The University of Chicago Press, Chicago, IL.

Mishkin, F. S. (1999), "International Capital Movement, Financial Volatility, and Financial Instability." NEBR working paper 6390.

Pagano, M. (1993), "Financial Markets and Growth: An Overview." *European Economic Review* 37, 613-622.

Panzar, J. C. and Rosse, J. N. (1987), "Testing for "Monopoly" Equilibrium." *Journal of Industrial Economics*, 35, 443-456.

Petersen, M. A. and Rajan, R. G. (1995), "The Effect of Credit Market Competition on Lending Relationships." *Quarterly Journal of Economics* 110, 407-443.

Rajan, R. G. and Subramanian, A. (2011), "Aid, Dutch Disease, and Manufacturing Growth." *Journal of Development Economics* 94, 106-118.

Rajan, R. G. and Zingales, L. (1998), "Financial Dependence and Growth." *American Economic Review* 88, 559-586.

Schaeck, K., Cihak, M., and Wolfe, S. (2009), "Are Competitive Banking Systems More Stable?" *Journal of Money, Credit and Banking* 41, 711-734.

Svaleryd, H. and Vlachos, J. (2005), "Financial Markets, the Pattern of Industrial Specialization and Comparative Advantage: Evidence from OECD Countries." *European Economic Review* 49, 113-144.

Vives, X. (2001), "Competition in the Changing World of Banking." *Oxford Review of Economic Policy*, 17, 535-547.

Table 1: Summary Statistics

| Country-Industry Level Variables | Mean | Std. Dev. | Max | Min | Obs. |
|---|---|---|---|---|---|
| `Export share`$_{i,k}$ | 0.519 | 1.484 | 21.717 | 0.000 | 1782 |
| Industry Level Variables | | | | | |
| `External finance`$_i$ | 0.253 | 0.324 | 1.140 | −0.451 | 1782 |
| `Tangibility`$_i$ | 0.304 | 0.135 | .671 | 0.075 | 1647 |
| `Human capital intensity`$_i$ | 1.017 | 0.262 | 1.656 | 0.502 | 1647 |
| `Physical capital intensity`$_i$ | 0.071 | 0.036 | .196 | 0.018 | 1647 |
| `Resource intensity`$_i$ | 0.259 | 0.438 | 1.000 | 0.000 | 1647 |
| Country Level Variables | | | | | |
| `Private credit`$_k$ | 0.412 | 0.266 | 1.323 | 0.022 | 1782 |
| `Volatility of private credit`$_k$ | 0.102 | 0.060 | .339 | 0.020 | 1701 |
| `Bank concentration`$_k$ | 0.737 | 0.177 | 1.000 | 0.343 | 1647 |
| `Human capital level`$_k$ | 1.994 | 0.562 | 3.340 | 1.231 | 1566 |
| `Physical capital level`$_k$ | 9.157 | 1.273 | 11.131 | 6.077 | 1620 |
| `Natural Resource Stock`$_k$ | 8987 | 9582 | 51090 | 880 | 1512 |

† '`Export share`$_{i,k}$' is the share of an industry's exports in GDP. '`External finance`$_i$', which is the fraction of investments not financed with internal funds for US firms in the same industry over the period of 1980-1990, is from Rajan and Zingales (1998). '`Tangibility`$_i$' is defined as net properties, plant, and equipment divided by the book value of assets. The industry-level data on tangibility are taken from Braun (2003). Bank development (`Private credit`$_k$) is measured by the sizes of domestic private credit relative to GDP in 1980. The volatility of bank development (`Volatility of private credit`$_k$) is calculated by the standard deviations of the growth of domestic private credit to GDP over the 1980-1997 period. '`Bank concentration`$_k$' is measured by the share of the three largest banks' assets over all commercial banks averaged over the period of 1989-1997. The original financial data set is taken from Beck, Demirgüç-Kunt and Levine (2010). Please refer to the text for the definitions and sources of all other variables.

Table 2: Cross-Country Financial Sector Information

| Country | Private credit | Volatility of private credit | Bank concentration |
|---|---|---|---|
| Argentina | 0.254 | 0.137 | 0.508 |
| Australia | 0.257 | 0.063 | 0.516 |
| Austria | 0.734 | 0.021 | 0.803 |
| Brazil | 0.425 | 0.121 | 0.605 |
| Barbados | 0.343 | 0.046 | 0.995 |
| Canada | 0.669 | 0.045 | 0.540 |
| Switzerland | 1.053 | 0.036 | 0.856 |
| Chile | 0.469 | 0.141 | 0.607 |
| Cote d'Ivoire | 0.408 | 0.097 | 0.933 |
| Cameroon | 0.295 | 0.182 | 0.962 |
| Colombia | 0.305 | 0.046 | 0.596 |
| Costa Rica | 0.279 | 0.122 | 0.880 |
| Denmark | 0.408 | 0.110 | 0.807 |
| Dominican Republic | 0.320 | 0.131 | 0.679 |
| Algeria | 0.422 | 0.339 | 0.909 |
| Ecuador | 0.225 | 0.152 | 0.922 |
| Egypt | 0.152 | 0.097 | 0.736 |
| Spain | 0.765 | 0.042 | 0.711 |
| Finland | 0.476 | 0.086 | 0.928 |
| France | 1.021 | 0.034 | 0.627 |
| United Kingdom | 0.276 | 0.098 | 0.783 |
| Ghana | 0.022 | 0.186 | 0.953 |
| Greece | 0.438 | 0.044 | 0.868 |
| Honduras | 0.288 | 0.102 | 0.453 |
| Haiti | 0.157 | 0.100 | 1.000 |
| Indonesia | 0.088 | 0.083 | 0.565 |
| India | 0.240 | 0.038 | 0.381 |
| Ireland | 0.424 | 0.035 | 0.764 |
| Iran (Islamic Republic of) | 0.438 | 0.087 | 1.000 |
| Israel | 0.708 | 0.065 | 0.853 |
| Italy | 0.560 | 0.034 | 0.646 |
| Jordan | 0.510 | 0.073 | 0.886 |
| Japan | 1.323 | 0.020 | 0.389 |
| Kenya | 0.295 | 0.072 | 0.649 |
| Republic of Korea | 0.507 | 0.039 | 0.373 |
| Kuwait | 0.377 | 0.187 | 0.683 |
| Sri Lanka | 0.172 | 0.244 | 0.787 |
| Morocco | 0.270 | 0.212 | 0.693 |
| Madagascar | 0.192 | 0.095 | 1.000 |
| Mexico | 0.194 | 0.190 | 0.713 |
| Malta | 0.300 | 0.060 | 0.929 |

To be continued.

Continued

| Country | Private credit | Volatility of private credit | Bank concentration |
|---|---|---|---|
| Mauritius | 0.228 | 0.045 | 0.948 |
| Malawi | 0.023 | 0.162 | 0.925 |
| Malaysia | 0.490 | 0.112 | 0.540 |
| Netherlands | 0.902 | 0.072 | 0.762 |
| New Zealand | 0.210 | 0.110 | 1.000 |
| Norway | 0.512 | 0.061 | 0.883 |
| Pakistan | 0.240 | 0.056 | 0.702 |
| Peru | 0.129 | 0.098 | 0.648 |
| Philippines | 0.422 | 0.159 | 0.845 |
| Portugal | 0.732 | 0.094 | 0.643 |
| Paraguay | 0.184 | 0.109 | 0.478 |
| Senegal | 0.427 | 0.103 | 0.864 |
| Singapore | 0.810 | 0.050 | 0.739 |
| El Salvador | 0.336 | 0.159 | 0.972 |
| Sweden | 0.755 | 0.065 | 0.903 |
| Thailand | 0.408 | 0.054 | 0.648 |
| Trinidad and Tobago | 0.287 | 0.101 | 0.699 |
| Tunisia | 0.464 | 0.059 | 0.531 |
| Turkey | 0.136 | 0.172 | 0.745 |
| Uruguay | 0.372 | 0.153 | 0.759 |
| Venezuela | 0.482 | 0.186 | 0.692 |
| South Africa | 0.556 | 0.110 | 0.892 |

† Bank development (`Private credit`) is measured by the sizes of domestic private credit relative to GDP in 1980. The volatility of bank development (`Volatility of private credit`) is calculated by the standard deviations of the growth of domestic private credit to GDP over the 1980-1997 period. '`Bank concentration`' is measured by the share of the three largest banks' assets over all commercial banks averaged over the period 1989-1997. The original financial data set is taken from Beck, Demirgüç-Kunt and Levine (2000, 2010).

Table 3: Benchmark Results

| | Panel A: Unconditional Estimates | | | | | Panel B: Conditional Estimates | | |
|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| External finance$_i$ × | 0.976*** | | −0.239 | | −0.149 | −0.149 | −0.062 | −0.326 |
| Private credit$_k$ | (0.281) | | (0.533) | | (0.464) | (0.304) | (0.281) | (0.285) |
| External finance$_i$ × | | −1.390*** | −1.548*** | −1.744*** | −1.839*** | −1.901*** | −1.765*** | −1.951*** |
| Volatility of private credit$_k$ | | (0.261) | (0.461) | (0.333) | (0.475) | (0.505) | (0.436) | (0.485) |
| External finance$_i$ × | | | | 1.812*** | 1.806*** | 1.878*** | 1.823*** | 1.250*** |
| Bank concentration$_k$ | | | | (0.477) | (0.475) | (0.513) | (0.470) | (0.456) |
| Physical capital intensity$_i$ × | | | | | | 0.462 | | 3.055*** |
| Physical capital level$_k$ | | | | | | (1.079) | | (1.286) |
| Human capital intensity$_i$ × | | | | | | 0.910*** | | 0.876*** |
| Human capital level$_k$ | | | | | | (0.266) | | (0.265) |
| Resource intensity$_i$ × | | | | | | 0.089** | | 0.018 |
| Natural resource stock$_k$ | | | | | | (0.045) | | (0.047) |
| Tangibility$_i$ × | | | | | | | 0.787 | 0.459 |
| Private credit$_k$ | | | | | | | (0.668) | (0.724) |
| Tangibility$_i$ × | | | | | | | 2.584** | 4.135*** |
| Volatility of private credit$_k$ | | | | | | | (1.107) | (1.319) |
| Tangibility$_i$ × | | | | | | | −0.064 | −1.681 |
| Bank concentration$_k$ | | | | | | | (1.214) | (1.392) |
| Country dummies | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Industry dummies | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| $R^2$ | 0.526 | 0.529 | 0.551 | 0.531 | 0.529 | 0.531 | 0.531 | 0.523 |
| $p$-value for Hansen $J$ test | 0.003 | 0.684 | 0.434 | 0.705 | 0.412 | 0.432 | 0.524 | 0.323 |
| Observations | 1727 | 1646 | 1646 | 1593 | 1593 | 1431 | 1593 | 1431 |

† The dependent variables are the export share for each 3-digit ISIC industry in each country during the 1980-1997 period. 'External finance$_i$' is the difference between industry investment and industry cash flow relative to industry investment. The level of banking development (Private credit$_k$) is measured by the ratio of domestic private credit to GDP in 1980. The volatility of banking development (Volatility of private credit$_k$) is measured by the standard deviation of the growth of the private credit by deposit money banks and other financial institutions over GDP during the 1980-1997 period. The index

of bank concentration (`Bank concentration`) is measured by the share of the three largest banks' assets over all commercial banks averaged over the period 1980-1997. Please also refer to the text for the definitions of other variables. Country and industry fixed effects are included in all regressions but not reported. Country and industry fixed effects are included in all regressions but not reported. All regressions obtained using the IV technique are estimated by using the English, French, German, and Scandinavian legal origin dummies as instrumental variables for the indicator of financial development and financial sector volatility, and in some cases additional instruments such as the shares of Catholic, Muslim and Protestant population in total population are included if needed. The Hansen $J$ tests provide statistical evidence to verify whether the over-identification problem exists. The heteroskedasticity-robust standard errors are reported in parentheses. $^{***}$, $^{**}$ and $^{*}$ denote significance at the 1%, 5% and 10% levels, respectively.

Table 4: Alternative Measures of International Trade

| | The Balassa index | | Net export share | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| `External finance`$_i$ × `Private credit`$_k$ | −0.128 | −0.070 | 0.002 | 0.001 |
| | (0.203) | (0.205) | (0.002) | (0.002) |
| `External finance`$_i$ × `Volatility of private credit`$_k$ | −1.401*** | −1.188*** | −0.005* | −0.006** |
| | (0.325) | (0.323) | (0.003) | (0.003) |
| `External finance`$_i$ × `Bank concentration`$_k$ | 0.878** | 0.784** | 0.003 | 0.003 |
| | (0.378) | (0.347) | (0.003) | (0.003) |
| All Controls | | Yes | | Yes |
| Country dummies | Yes | Yes | Yes | Yes |
| Industry dummies | Yes | Yes | Yes | Yes |
| $R^2$ | 0.415 | 0.448 | 0.202 | 0.214 |
| $p$-value for Hansen $J$ test | 0.156 | 0.008 | 0.644 | 0.617 |
| Observations | 1566 | 1416 | 1566 | 1416 |

† The Balassa index (Balassa, 1986) is defined as $1 + \frac{X_{i,k}-M_{i,k}}{X_{i,k}+M_{i,k}}$, where $X_{i,k}$ denotes the real exports of industry $i$ of country $k$, while $M_{i,k}$ denotes the real imports of industry $i$ of country $k$. The net export share is measured as $\frac{X_{i,k}-M_{i,k}}{rGDP}$, with $X_{i,k}$ and $M_{i,k}$ as defined previously and $rGDP$ as the real GDP. Each of these two variables are averaged over the 1980-1997 period. For the definitions of other variables, please see Table 4. All regressions obtained from using the IV technique are estimated by using the English, French, German, and Scandinavian legal origin dummies as instrumental variables for the volatility of financial development, and in some cases additional instruments such as the shares of Catholic, Muslim and Protestant population in total population are included if needed. The Hansen $J$ tests provide statistical evidence to verify whether the over-identification problem exists. The heteroskedasticity-robust standard errors are reported in parentheses and ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.

Table 5: Alternative Volatility Measures of Bank Development

| | Volatility of Bank Development$_k$ Measured as | | | | | |
|---|---|---|---|---|---|---|
| | Range of private credit | | Std. dev. of bank assets | | Std. dev. of liquid liabilities | |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| External finance$_i$ × Bank development$_k$ | −0.035 | −0.147 | −1.064* | −1.306* | −0.305 | −0.065 |
| | (0.275) | (0.308) | (0.629) | (0.709) | (0.316) | (0.301) |
| External finance$_i$ × Volatility of bank development$_k$ | −1.937*** | −2.136*** | −3.136*** | −3.417*** | −1.482*** | −1.487*** |
| | (0.478) | (0.573) | (1.014) | (1.139) | (0.384) | (0.373) |
| External finance$_i$ × Bank concentration$_k$ | 2.104*** | 2.258*** | 2.294*** | 2.556*** | 1.103*** | 1.019*** |
| | (0.526) | (0.592) | (0.750) | (0.859) | (0.391) | (0.394) |
| All Controls | | Yes | | Yes | | Yes |
| Country dummies | Yes | Yes | Yes | Yes | Yes | Yes |
| Industry dummies | Yes | Yes | Yes | Yes | Yes | Yes |
| $R^2$ | 0.523 | 0.522 | 0.494 | 0.481 | 0.522 | 0.532 |
| $p$-value for Hansen $J$ test | 0.927 | 0.756 | 0.860 | 0.876 | 0.037 | 0.310 |
| Observations | 1593 | 1431 | 1593 | 1431 | 1593 | 1431 |

† The levels of banking development are respectively measured by (1) the ratio of domestic private credit to GDP, (2) deposit money bank assets over GDP, and (3) liquid liabilities over GDP. The volatility of banking development referred to as 'Range of private credit' is measured by the range of growth of the private credit by deposit money banks and other financial institutions over GDP during the 1980-1997 period. The volatility of banking development referred to as the 'Std. dev. of bank assets' is the standard deviation of the growth of deposit money bank assets over GDP over the 1980-1997 period. The volatility of banking development referred to as the 'Std. dev. of liquid liability' is the standard deviation of the growth of liquid liabilities over GDP, during the 1980-1997 period. Country and industry fixed effects are included in all regressions but not reported. For the definitions of other variables, please see Table 4. All regressions obtained from using the IV technique are estimated by using the English, French, German, and Scandinavian legal origin dummies as instrumental variables for the indicator of financial sector volatility, and in some cases additional instruments such as the shares of Catholic, Muslim and Protestant population in total population are included if needed. The Hansen $J$ tests provide statistical evidence to verify whether the over-identification problem exists. The heteroskedasticity-robust standard errors are reported in parentheses and ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.

Table 6: Alternative Measures of Market Structure

| | Market structure measured as | | | | | |
|---|---|---|---|---|---|---|
| | Conc-SCW | | Conc-G | | H-BS | |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| External finance$_i$ × Private credit$_k$ | −0.034 | −0.031 | −0.142 | −0.200 | −0.106 | −0.123 |
| | (0.285) | (0.271) | (0.257) | (0.268) | (0.228) | (0.244) |
| External finance$_i$ × Volatility of private credit$_k$ | −1.762*** | −1.694*** | −1.502*** | −1.508*** | −1.437*** | −1.338*** |
| | (0.447) | (0.425) | (0.409) | (0.414) | (0.352) | (0.367) |
| External finance$_i$ × Banking market structure$_k$ | 2.492*** | 2.196*** | 1.260** | 1.776*** | −0.479** | −0.364* |
| | (0.787) | (0.745) | (0.514) | (0.512) | (0.214) | (0.217) |
| All Controls | | Yes | | Yes | | Yes |
| Country dummies | Yes | Yes | Yes | Yes | Yes | Yes |
| Industry dummies | Yes | Yes | Yes | Yes | Yes | Yes |
| $R^2$ | 0.553 | 0.565 | 0.536 | 0.552 | 0.549 | 0.565 |
| $p$-value for Hansen $J$ test | 0.474 | 0.393 | 0.303 | 0.283 | 0.792 | 0.050 |
| Observations | 972 | 945 | 1241 | 1161 | 999 | 945 |

† Alternative indices of bank concentration are obtained from three different sources. 'Conc-SCW' is a concentration variable measured as the market share of the three largest banks in each country from Schaeck, Cihak, and Wolfe (2009). 'Conc-G' measured as bank-market concentration is the fraction of bank assets held by the three largest commercial banks in a country from González (2009). 'H-BS' is the $H$-statistic, which measures the degree of competition by Panzar and Rosse's (1987) methodology, from Bikker and Spierdijk (2008). For the definitions of other variables, please see Table 4. All regressions obtained from using the IV technique are estimated by using the English, French, German, and Scandinavian legal origin dummies as instrumental variables for the indicator of financial sector volatility, and in some cases additional instruments such as the shares of Catholic, Muslim and Protestant population in total population are included if needed. The Hansen $J$ tests provide statistical evidence to verify whether the over-identification problem exists. The heteroskedasticity-robust standard errors are reported in parentheses and ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.

Table 7: Developed Countries vs. Developing Countries

| | Developed Countries | | Developing Countries | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| External finance$_i$ × Private credit$_k$ | 0.065 | 0.075 | 0.090 | −0.098 |
| | (0.301) | (0.292) | (0.296) | (0.317) |
| External finance$_i$ × Volatility of private credit$_k$ | −0.998*** | −0.995*** | −2.540*** | −3.453*** |
| | (0.383) | (0.369) | (0.766) | (1.189) |
| External finance$_i$ × Bank concentration$_k$ | 0.489 | 0.633 | 2.727*** | 3.748*** |
| | (0.518) | (0.466) | (0.773) | (1.228) |
| All Controls | | Yes | | Yes |
| Country dummies | Yes | Yes | Yes | Yes |
| Industry dummies | Yes | Yes | Yes | Yes |
| $R^2$ | 0.668 | 0.677 | 0.480 | 0.454 |
| $p$-value for Hansen $J$ test | 0.141 | 0.053 | 0.242 | 0.418 |
| Observations | 540 | 540 | 1053 | 891 |

† The developed countries, defined as those countries that joined the OECD before 1980, include Australia, Austria, Canada, Switzerland, Denmark, Spain, Finland, France, the United Kingdom, Greece, Ireland, Italy, Japan, the Netherlands, Norway, Portugal, Sweden, and Turkey, while the rest of the countries in Table 3 are grouped as developing countries. For the definitions of other variables, please see Table 4. All regressions obtained from using the IV technique are estimated by using the English, French, German, and Scandinavian legal origin dummies as instrumental variables for the volatility of financial development, and in some cases additional instruments such as the shares of Catholic, Muslim and Protestant population in total population are included if needed. The Hansen $J$ tests provide statistical evidence to verify whether the over-identification problem exists. The heteroskedasticity-robust standard errors are reported in parentheses and ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively.