Banking Stability, Competition, and Economic Volatility

Ana I. Fernández*

Francisco González*

University of Oviedo

Nuria Suárez *†

Public University of Navarre

This draft: July, 2014

Abstract

The paper analyzes the influence of banking stability on the volatility of industrial value added and how it varies across 110 countries depending on bank market competition and bank-firm relationships. We find that banking stability reduces the volatility of value added more in industries that have greater external dependence and intangible intensity when they are located in countries with more developed financial systems and better investor protection. These results are consistent with the relevance of a *lending channel* and an *asset allocation channel* such as the channels through which banking stability diminishes industrial economic volatility. Moreover, we find that banking stability helps reduce economic volatility more, through both channels, in countries that have less bank market competition or close bank-firm relationships. We use several proxies for banking stability and control for countries' banking development, reverse causality problems, and endogeneity of banking stability.

Keywords: Banking stability, Competition, Economic Volatility, Regulation

JEL Codes: G21; G32; O40

†Corresponding author: Nuria Suárez, Public University of Navarre, Faculty of Business and Economics. Department of Business Administration, Arrosadía Campus. 31006, Pamplona – Navarre (Spain) Phone: +34.948.166.085. E-mail: nuria.suarez@unavarra.es

Ana I. Fernández and Francisco González acknowledge financial support from the Spanish Ministry of Economy and Competitiveness, Project ECO2012-31772. Nuria Suárez acknowledges financial support from the Spanish Ministry of Economy and Competitiveness, Project ECO2012-35946.

1. Introduction

Previous research has revealed that financial development is an essential determinant of a country's economic growth and stability. A more developed banking system promotes a country's economic growth during normal periods (Rajan and Zingales, 1998; Levine, 2005; Ongena and Giannetti, 2009) and reduces economic volatility (Denizer et al., 2002; Easterly et al., 2000; Larrain, 2006; Raddatz, 2006).The positive effect on economic volatility operates by reducing firms' dependence for investment on their internal funds and allows for a lower impact of real shocks on economic volatility. Only empirical evidence provided by Beck et al. (2006) questions the positive effect of financial development on economic volatility depending on the type of shock. They show, using country data, that financial development dampens the effect of real shocks but magnifies the effect of monetary shocks. The net effect would thus depend on the predominant type of shock. Previous research has also revealed that financial stability promotes economic growth, especially in countries with more developed banking systems (Kroszner et al., 2007; Dell'Ariccia et al., 2008).

None of these previous papers have analyzed how banking stability impacts on economic volatility. What are the channels through which banking stability affects economic volatility? Does the influence of banking stability on economic volatility vary across countries depending on national characteristics? These are the research questions of this paper. We broaden the evidence and directly analyze the influence of banking stability on economic volatility after controlling for the influence of financial development. We also analyze the channels through which banking stability impacts on economic volatility, and how this influence varies across countries depending on countries' bank market competition and bank-firm relationships.

Our empirical study uses industry-level data from 110 countries over the 1989-2008 period. As lower economic volatility also promotes banking stability, we extend the traditional setup of Rajan and Zingales (1998) and Claessens and Laeven (2003) to identify the causality running from banking stability to economic volatility. We focus on sectors especially dependent on external finance and with higher intangible intensity as they should suffer more the consequences of banking stability through the reduction of credit supply and changes in bank risk-taking incentives.

We examine two channels through which banking stability may affect economic volatility: the *lending channel* and the *asset allocation channel*. The lending channel refers to the volatility of the credit supply. Lower banking stability increases the volatility of funds available to firms from banks. In imperfect capital markets, firms cannot totally substitute banks' funds if banks reduce credit supply so that debtors are obliged to reduce investment. In this scenario, greater volatility of credit supply can be expected to increase economic volatility. This lending effect on economic volatility would be more relevant in more financially-dependent industries and in more developed banking systems. The asset allocation channel is related to how higher bank risk-taking incentives affect firms' risk-taking. The less risk-averse banks are, the less reluctant they are to accept riskier behavior by their debtors. Greater risk-taking behavior by firms promoted by less risk-averse behavior by banks can be expected to increase economic volatility. As changes in firms' risk are more likely in industries that are more intense in intangible assets, we expect the asset allocation effect to be higher in these industries. Moreover, we expect the asset allocation effect to be greater in countries with better institutional quality. John et al. (2008) show that better investor protection in a country increases firms' incentives to take risk and means that higher bank risk-taking incentives lead to higher risk taking by firms in these countries.

Our paper also analyzes how the influence of banking stability on economic volatility varies across countries depending on bank market competition and bank-firm relationships. Specifically, we analyze how bank market competition, bank concentration, legal entry requirements into banking, and restrictions on bank ownership and control of non-financial firms shape the influence of banking stability on economic volatility through both the lending and asset allocation channels. In this analysis, we have to separate the impact of these national characteristics on the influence of banking stability on economic volatility from their direct influence on banking stability.

We find that banking stability reduces the volatility of industry value added more in industries that have more external dependence and intangible intensity when they are located in countries with more developed financial systems and better investor protection. The results indicate that banking stability reduces economic volatility through both the lending channel and the asset allocation channel. We also find that banking stability helps reduce economic volatility more, through both channels, in countries with less bank market competition or close bank-firm relationships. The results are robust when we use alternative proxies for

banking stability, such us the existence of a banking crisis, or alternative methods to control for the endogeneity of banking stability.

The rest of the paper is organized as follows. Section 2 provides a brief review of the related literature and discusses the hypotheses. Section 3 describes the data, methodology, and variables. Section 4 presents the empirical results and robustness checks and, finally, Section 5 concludes.

2. Theoretical Background and Hypotheses

The banking literature highlights the importance of bank risk-taking incentives in the presence of a deposit insurance scheme and the negative effects of banking crises on economic growth (Kroszner et al., 2007; Dell'Ariccia et al., 2008). The control of bank risk-taking incentives has therefore become the main task of regulatory and supervisory authorities to avoid the negative real effects of banking crises, especially when increased bank competition erodes bank charter value and exacerbates bank risk-taking incentives induced by deposit insurance and other safety nets (Keeley, 1990). Our paper focuses on how banking stability impacts on economic volatility, and is related to several strands of literature.

First, our paper is related to the literature analyzing the effect of banking crises on economic growth as banking crises are the clearest ex-post measure of low banking stability. Kroszner et al. (2007) and Dell'Ariccia et al. (2008) confirm that systemic banking crises reduce economic growth by reducing bank credit supply and that this negative real effect is stronger in more financially-dependent industries located in countries with more developed banking systems. Fernández et al. (2013b) show that banking crises diminish economic growth not only by reducing the credit supply but also by negatively affecting firms' intangible investments, especially in countries with highly-developed institutions. These papers analyze the consequences of banking instability on economic growth but none of them focuses on the impact on economic volatility.

Second, it is related to the literature analyzing the relationship between financial development and economic volatility. The most recent evidence indicates that greater banking development reduces economic volatility (Easterly et al., 2000; Denizer et al., 2002; Larrain, 2006; Raddatz, 2006). Banking development reduces volatility because it helps firms facing net worth problems to obtain the necessary working capital to finance their operations.

Investment by firms would then be less dependent on internal funds and bank funding would help reduce the impact of real shocks on economic volatility. In this case, banking development should lead to a relatively larger reduction in volatility in more financially-dependent industries. Moreover, if financial constraints are tighter during contractions so that borrowing is countercyclical, banking development would lead to an even greater reduction in economic volatility. Beck et al. (2006) confirm at country level that banking development dampens the impact of real shocks on economic volatility because it alleviates the cash-flow constraints of firms that depend on external financing. However, they argue that financial intermediaries magnify the effect of monetary shocks on economic volatility. They identify monetary shocks with shocks to banks' balance sheets. The net effect of banking development on economic volatility is not unambiguous and will depend on the relative importance of real versus monetary shocks. Our paper is closely related to Beck et al. (2006) but we directly analyze the impact of banking stability on economic volatility and use industry data. We separate the effect of banking stability through the lending and asset allocation channels, control for reverse causality focusing on more financial dependent industries, and analyze the influence of country characteristics.

Third, our paper is related to the extensive literature analyzing the influence of bank competition on economic growth and financial stability. Empirical evidence suggests that less bank competition in imperfect capital markets fosters economic growth by increasing banks' incentives to invest in the acquisition of soft information by establishing close relationships with borrowers over time, facilitating the availability of credit and thereby reducing firms' financial constraints (Petersen and Rajan, 1994, 1995; Cetorelli and Gambera, 2001).The influence of bank competition on financial stability has promoted an intense debate in the banking literature. The traditional "competition-fragility" view (Keeley, 1990) has been challenged by the "competition-stability" view (Boyd and De Nicolò, 2005). Recent evidence shows that the relationship between bank competition and financial stability varies across countries depending on bank regulation and financial development (Beck et al., 2013) and depending on whether country-level or bank-level measures of market power are used (Kick and Prieto, 2014). We provide new evidence in the context of this literature by analyzing how bank market competition and bank-firm relationships shape the influence of banking stability on economic volatility.

In this paper we merge these strands of literature and we directly analyze how banking stability impacts on economic volatility. We distinguish between two potential channels or effects of banking stability on economic volatility. First, a finance or lending channel associated with the volatility of bank credit supply. Higher bank volatility or a greater probability of shocks to banks' balance sheets would increase the volatility of funds available to firms from banks. In imperfect capital markets, firms could not totally substitute banks' funds when they are reduced so they would then be obliged to reduce investment, increasing growth volatility. This channel is similar to the effect of monetary shocks analyzed by Beck et al. (2006). We expect this to be more relevant for industries that are more dependent on external finance and located in countries with more developed banking systems. Our first hypothesis is:

> **H1.** *Banking stability decreases economic volatility more in more financially-dependent industries in countries that have more developed banking systems (the lending channel).*

A second channel stems from the influence of banks' risk-taking incentives on investment by firms. Banks are less (more) reluctant to accept riskier behavior by their debtors if they are less (more) risk averse. We refer to this effect as the asset allocation channel. We expect this effect to be more relevant for industries with more intangible assets in countries with better investor protection or institutional quality. Intangible assets are riskier and have less value when a firm is liquidated. So higher bank risk-taking incentives may have a greater impact on changes in firm's risk-taking in industries that have a higher proportion of intangible assets. Institutional quality also affects the propagation of bank risk-taking incentives to its firms' risk-taking. John et al. (2008) show that a country's investor protection is positively related to firm's risk-taking. Several reasons explain this positive relation. In countries with well-developed institutions and good investor protection, insiders have lower private benefits in the firms that they control. Lower private benefits increase insiders' incentives to take risk because lower private benefits will be lost if risky investments fail. Good-quality institutions also favor disperse ownership (La Porta et al., 2000) and disperse ownership leads to higher risk-taking through improved shareholders' diversification. Our second hypothesis, therefore, is:

H2. *Banking stability decreases economic volatility more in more intangible-intensive industries in countries that provide better investor protection (the asset allocation channel*).

Finally, we analyze if the influence of banking stability on economic volatility, through the lending and asset allocation channels, varies across countries depending on bank competition and bank-firm relationships. We use direct proxies for bank competition such as the Lerner index and the Boone indicator and indirect proxies such as bank market concentration and countries' regulation on entry requirements into banking. We use the legal restrictions on bank ownership and control of non-financial firms to proxy for ownership relationships between banks and their debtors.

Previous literature suggests that a non-competitive banking market has a beneficial effect by promoting lending relationships and providing funds for firms. Cetorelli and Gambera (2001) and Claessens and Laeven (2005) show that the lower the competition in the banking market, the higher the credit provided to firms that are more dependent on external finance. Close lending relationships between banks and firms create switching costs for borrowers when changing lenders (Petersen and Rajan, 1994, 1995; Cetorelli and Gambera, 2001). If the relationship bank goes bankrupt, some of its borrowers might be obliged to borrow from non-relationship banks. These borrowers would face an adverse selection problem as non-informed banks will prefer to allocate their funds to the better known, but less profitable, projects of relationship firms (Detragiache et al., 2000). The consequence is that lending relationships increase the impact of a given volatility of bank credit supply on economic volatility. Fernández et al. (2013a) show that sectors that depend on external finance where market power promotes higher (lower) growth during normal periods also suffer on average a higher (lower) reduction in growth during a systemic banking crisis. Their finding is consistent with bank market power enhancing lending relationships in normal times and the existence of switching costs for firms when changing lenders during a systemic banking crisis. In such cases, less competitive banking markets or closer bank-firm relationships would increase the impact of banking stability on economic volatility through the lending channel.

Moreover, close relationships between banks and borrowers reduce adverse selection and moral hazard problems associated with firms' investments and explain why some intangible assets may be financed with debt (Claessens and Laeven, 2003). We would thus expect close

relationships between banks and borrowers to increase the asset allocation effect of banking stability on economic volatility. The reason is that a higher proportion of firms' intangible assets, promoted by close relationships, means that changes in bank's risk- taking incentives are likely to induce more changes in firms' risk-taking. Our third hypothesis is:

> **H3**. *Less banking competition or more bank-firm relationships increase the lending and asset allocation effects of banking stability on economic volatility.*

3. Data, methodology, and variables

3.1. Data

We use industry-specific and country-specific data from a variety of sources. We use a total sample of 110 developed and developing countries over the 1989-2008 period and aggregate data over different time periods. We report results for a 5-years period (aggregated over the periods 1989-1993, 1994-1998; 1999-2003, and 2004-2008).[1]We collect industry-level data on annual real value added from the UNIDO Industrial Statistic Database (2013). This database contains information on 23 industrial sectors at the 2-digit ISIC disaggregation level for the 1963-2010 period. As we use real values, we use the Consumer Price Index (CPI) from International Financial Statistics of the International Monetary Fund (IMF) to deflate the industrial value added. Therefore, all data are expressed in US dollars and in real prices.

Country-level data on banking stability, financial development, and bank market competition and concentration come from the Global Financial Development Database (GFDD) collected by the World Bank. Proxies for regulatory variables come from the World Bank's Bank Regulation and Supervision Database. Proxies for countries' investor protection and institutional quality come from the World Bank Institute's Governance Group and the Heritage Foundation.

Our final sample is made up of an unbalanced panel for a maximum of 4,993 industry-year observations in 110 developed and developing countries during the 1989-2008 period. We

[1]Beck et al. (2006) apply the same procedure to analyze how the impact of financial development on growth volatility varies depending on real and monetary shocks. In further robustness tests we check that the results do not change when we use a 3-year period or a 4-year period for aggregating data.

exclude USA from the analysis because it is our benchmark in order to define an exogenous proxy for industry's external dependence and intangible intensity.

3.2. Methodology

We run estimations using industry-level data on the volatility of value added as the dependent variable. We regress economic volatility on banking stability and control for banking development and other relevant factors. We extend the basic setup of Rajan and Zingales (1998) and Claessens and Laeven (2003) to control for reverse causality between banking stability and economic volatility. Thus, we focus on more financially-dependent industries to identify causality from financial to the real sector.[2] Our basic model is:

$$\begin{aligned} VOLATILITY\_VA_{i,j,t} = {} & \alpha_0 + \alpha_1 ISHARE_{i,j} + \\ & + \alpha_2 ED_i * FD_{j,t} \\ & + \alpha_3 BANKSTAB_{j,t} * ED_i \\ & + \theta_{i,j} + \lambda_{i,t} + \varphi_{j,t} + \varepsilon_{i,j,t} \end{aligned} \qquad [1]$$

$VOLATILITY\_VA_{i,j,t}$ is the relative standard deviation of real value added of industry i in country j for the t period. $ISHARE_{i,j}$ is the share of industry i in the total value added of country j at the first 5-year period (1989-1993, or first available sub-period). It aims to capture the possibility that a more developed or mature sector is systematically less volatile (Raddatz, 2006). ED_i is the external dependence ratio of sector i. $FD_{j,t}$ is the development of the banking system of country j in period t. $BANKSTAB_{j,t}$ is the proxy for banking stability in country j during period t.

The interaction $ED_i * FD_{jt}$ controls for the influence of banking development on economic volatility. Previous evidence shows that banking development reduces the impact of real shocks on economic volatility (Larrain, 2006; Raddatz, 2006; Beck et al., 2006). We interact banking development with the external dependence ratio of the industry to control for potential reverse causality between economic volatility and banking development. If

[2]This approach was initially applied by Rajan and Zingales (1998) and subsequently used by Cetorelli and Gambera (2001), Claessens and Laeven (2003), Fisman and Love (2003), and Braun and Larrain (2005) to investigate the effects of bank concentration, property rights, trade credit usage, and recessions, respectively, on industrial growth. Kroszner et al. (2007) and Dell'Ariccia et al. (2008) have applied this approach to study the real effects of banking crises. Raddatz (2006) used this setup to specifically analyze the influence of banking development on economic volatility.

industries that depend more on external finance benefit the most from banking development, we would expect to reduce the sensitivity of firms' investment to internal funds more in industries that are more dependent on external finance. Thus, a negative coefficient for α_2 would indicate causality from banking development to economic volatility and would be consistent with previous evidence (Larrain, 2006; Raddatz, 2006, and Beck et al., 2006).

The interaction $BANKSTAB_{j,t}$ * ED_i captures the influence of banking stability on economic growth after controlling for banking development. We interact banking stability with industries' external dependence to control for potential reverse causality between banking stability and economic growth. As industries with greater dependence on external finance are more sensitive to banking shocks, we assume that $\alpha_3$captures causality running from banking stability to economic growth. Thus, a negative coefficient for α_3 would indicate that banking stability reduces economic volatility.

We include three specific effects: industry-country ($\theta_{i,j}$), industry-period ($\lambda_{i,t}$), and country-period ($\varphi_{j,t}$). The three sets of specific effects should control for most shocks affecting the volatility of industrial value added. The industry-country specific effect should control not only for characteristics that are specific to either an industry or a country, but also for characteristics that are specific to an industry located in a particular country, as long as these are persistent over time. These include, for instance, the effect of persistent differences in size, concentration, financial frictions, or government intervention and support, derived from different factor endowments, market size, or institutional characteristics that may generate different volatility of value added patterns across industries and countries. The industry-period specific effect controls for worldwide industry shocks. Finally, the country-period specific effect controls for aggregate country-specific shocks. This approach has the advantage that it avoids the need for the financial development, the measure of banking stability, and the variable to proxy industrial external dependence to enter the regression on their own. It allows us to focus only on the terms of their interaction. Moreover, inclusion of these specific effects is less likely to suffer from omitted variable bias or model specification than traditional regressions.[3]

We extend the basic model to separate the lending and asset allocation effects. The exact specification is as follows:

[3] Dell'Ariccia et al. (2008) use the same procedure to examine the effects of systemic banking crises on economic growth of industries with different levels of external financial dependence.

$$VOLATILITY\_VA_{i,j,t} = \beta_0 + \beta_1 ISHARE_{i,j} + \\ + \beta_2 ED_i * FD_{j,t} \\ + \beta_3 BANKSTAB_{j,t} * ED_i * FD_j \\ + \beta_4 BANKSTAB_{j,t} * INTAN_i * LAW_j \\ + \theta_{i,j} + \lambda_{i,t} + \varphi_{j,t} + \varepsilon_{i,j,t} \quad [2]$$

Where $INTAN_i$ is the intangible intensity of industry i. LAW_j is our proxy for a country's investor protection.

We include two additional terms to analyze the channels through which banking stability impacts on economic volatility after controlling for banking development. These triple interaction terms are the main contribution of the paper. The first triple interaction term ($BANKSTAB_{j,t} * ED_i * FD_{j,t}$) captures the relevance of the lending channel to explain how banking stability impacts on the volatility of industrial value added. To identify the causality from banking stability to economic volatility, we interact BANKSTAB with the industry's external dependence. Again, our premise is that banking stability has a greater effect on the availability of funding for industries that are more dependent on external finance. Therefore, lower economic volatility associated with more banking stability in more financially-dependent industries would indicate that at least part of the causality runs from banking stability to economic volatility. Moreover, a more developed banking system will increase the change in credit supply that is associated with a particular level of banking stability. For that reason, we include $FD_{j,t}$ as an additional interaction term to capture the relative importance of the lending channel on economic volatility. A negative coefficient $\beta_3$would be consistent with our Hypothesis 1, i.e, with banking stability reducing economic volatility through the lending channel.

We include a second interaction term: $BANKSTAB_{j,t} * INTAN_i * LAW_j$. This triple interaction term should capture the impact of banking stability on economic volatility through the asset allocation channel.[4] The interaction of banking stability with the industry's intangible intensity aims to control for reverse causality between economic volatility and the asset allocation effect of banking stability. We would expect that industries with more intangible assets are the most sensitive to higher bank risk-taking incentives. We additionally include

[4] Claessens and Laeven (2003) follow a similar approach to capture the asset allocation effect of financial development on industrial economic growth.

the interaction with the country's institutional quality because the ability of bank risk-taking incentives to really induce higher risk-taking by firms depends on the quality of the country's institutions. John et al. (2008) show that better investment protection leads corporations to undertake riskier projects. It reduces corporate insiders' private benefits and their incentives to behave prudently as lower private benefits will be lost if risky investments fail. It also allows for dispersed ownership structures that promote better risk diversification and, consequently, higher risk-taking by firms. Higher bank risk-taking incentives will therefore increase firms' risk-taking more in countries with better investor protection. A negative coefficient of β_4 would be consistent with our hypothesis 2 by suggesting that greater banking stability reduces economic volatility through the asset allocation channel, especially in more intangible intensive industries in countries with good investor protection.

We also estimate model [2] separately in different sub-samples of countries depending on bank market competition, concentration, legal bank entry requirements, and restrictions on bank ownership and control of non-financial firms.

The regressions are estimated using instrumental variables (IV) and ordinary least squares (OLS). We estimate standard errors clustered by industry and country to capture correlations of different industries affected by the same country-level characteristics. This correlation is captured by the industry-country dummies if the country-level effect is fixed, but we adopt a general approach following Petersen (2009). We do not make assumptions on the precise form of the dependence across standard errors and cluster them by two dimensions simultaneously (industry and country).

The IV (Instrumental Variables) methodology allows us to focus on the influence of the exogenous component of our explanatory variables. We apply several procedures to control for their potential endogeneity. Following Rajan and Zingales (1998), we use predetermined values of industry's external dependence and intangible intensity. We use different instruments for banking stability and development in a country. There is evidence showing that bank regulation, competition, and market structure affects both banking stability and development (Keeley, 1990; Barth et al., 2004; Beck et al., 2013, among others). As we aim to analyze how these country variables shape the influence of banking stability on economic volatility, we need to isolate the exogenous component of banking stability and development. Otherwise, we would mix the direct influence of these country variables on banking stability

and development with their influence on the relationships between banking stability and economic volatility.

Following the law and finance literature (La Porta et al., 2000; Barth et al., 2004), our instruments are the four legal origin dummy variables (English, French, German and Scandinavian) and time dummies. We check that the results do not change when we use as alternative instruments: 1) the initial values (in the sub-period 1989-1993, or first available) of, respectively, banking stability or financial development, and 2) when we add to the four legal origin dummy variables and time, three measures of banking sector regulation – regulation on non-traditional banking activities, overall bank capital stringency, and legal entry requirements into the banking industry–; and an index measuring the institutional quality of the country (the rule of law).

To test the suitability of our Instrumental Variables (IV) estimator, we perform the Durbin-Wu-Hausman statistic test which verifies the null hypothesis that the introduction of IVs has no effect on estimates of the regression's coefficients. We report IV estimations when the test is rejected at the 10 percent level or less. Otherwise, we report OLS estimates using the observed values of financial development and bank Z-score.[5]

3.3. Variables

3.3.1. Economic Volatility

Our dependent variable is the relative standard deviation of real value added of each industry in each country. We compute the standard deviation of real value added in each industry following previous studies (Larrain, 2006; Raddatz, 2006; Beck et al., 2006). Additionally, we normalize the standard deviation by the average value added, as in Klomp and de Haan (2009), to obtain a relative standard deviation. This measure incorporates the effect of growth differences across industries with different levels of volatility and allows us to infer clearer implications in terms of welfare. Higher banking stability might reduce not only economic volatility but also economic growth because bank risk-taking may promote more risky and profitable investments by firms. Our relative standard deviation captures the effect of banking stability on economic volatility after taking into account growth differences. Our volatility indicator is:

[5] The results of the first stage regressions are available from the authors upon request and the F-test confirms that the selected instruments are jointly highly significant in all the first stage regressions.

$$\sigma_{i,j,t} = \frac{\sqrt{\sum\left(y_{i,j,t} - \bar{y}_{i,j,T}\right)^2}}{\left|\bar{y}_{i,j,t}\right|}$$

Where $y_{i,j,t}$ is the real value added of industry *i* in country *j* at time *t*. $\bar{y}_{i,j,t}$ is the average industrial real value added in a five-year period of industry *i* in country *j* over period t. We calculate the relative standard deviation using annual data over a five-year period. We analyze the whole period of 1989-2008 and then aggregate data over the periods 1989-1993, 1994-1998, 1999-2003, and 2004-2008. In our estimations, we use the natural logarithm of $\sigma_{i,j,t}$to make the dependent variablenormally distributed. We check the robustness of the results using the standard deviation of real value added (without dividing by growth), which is mostly used in previous studies.

Table 1 shows the country mean values of the variables used in the empirical analysis. We observe that the countries with higher volatility of industrial value added over the whole period (1989-2008) are Central African Republic (1.8930), Côte d'Ivoire (0.8554), Niger (0.7209) and Iraq (0.4069). The countries with the lowest levels of industrial value added volatility are Pakistan (-1.8706), Switzerland (-1.6959), Paraguay (-1.6272) and Belarus (-1.5939). Table 2 shows the mean values of the main variables by industrial sectors. The Leather industry presents the lowest volatility of value added. Industries like Coke, Petroleum, and Nuclear, or Office, Accounting, and Computing Machinery are the industries with the highest value added volatility.

3.3.2. Banking Stability

We use two main proxies for banking stability (BANKSTAB): The Z-score and the ratio of non-performing loans to total loans (NPL). The Z-score (ZSCORE) is a measure of bank insolvency risk. It is calculated at bank-level as the return on assets plus the capital-asset ratio divided by the standard deviation of asset returns. Specifically, ZSCORE = (ROA+CAR)/SDROA, where ROA is the rate of return on assets, CAR is the capital-asset ratio, and SDROA is an estimate of the standard deviation of the rate of return on assets. A higher Z-score indicates that the bank is more stable because it is inversely related with the probability of bank insolvency. Since the Z-score is highly skewed, we use the natural logarithm of Z-score, which is normally distributed. Laeven and Levine (2009), Houston et

al. (2010), Beck et al. (2013), among others, have recently used the Z-score as a proxy for bank insolvency risk.

We also use the ratio of non-performing loans in a country as an alternative proxy for banking stability (NPL). This is a traditional ex-post measure of bank credit risk and is defined as the ratio of defaulting loans (payments of interest and principal past due date by 90 days or more) to total gross loans.

As we perform the empirical analysis at banking industry level, we use the aggregated value by country and period of both variables. To do this, we consider the measure of each variable at country-level provided by the World Bank's GFDD. Country-level values are calculated, using information from Bankscope, as the weighted bank average of each variable. The weights are the participation of the bank assets in the total assets of the banking system.[6] In our sample, ZSCORE ranges from a minimum value of -0.1325 in Thailand to a maximum value of 3.0520 in Cyprus. Bangladesh presents the highest value in the ratio non-performing loans to gross loans (29.91%) and Luxembourg the lowest one (0.42%).

3.3.3. Industries' External Dependence and Intangible Intensity

We measure external dependence for each industrial sector (ED) using the index calculated by Rajan and Zingales (1998) for a sample of US firms. This index is defined as the fraction of capital expenditure not financed with cash-flow from operations constructed at industry-level. This approach offers a valid and exogenous way of identifying the extent of an industry's external dependence anywhere in the world. An important assumption underlying it is that external dependence reflects technological characteristics of the industry that are relatively stable across space and time. Cetorelli and Gambera (2001), Claessens and Laeven (2003), Kroszner et al. (2007), and Dell'Ariccia et al. (2008), among others, have previously used this approach to proxy the exogenous component of industry's external dependence.

We follow a similar approach to only consider the exogenous component of industries' intangible intensity. We use the benchmark data from Claessens and Laeven (2003) for our measure of intangible intensity. Like Rajan and Zingales (1998) with the exogenous component of industries' external dependence, Claessens and Laeven (2003) assume that the intangible intensity for each industry in the US is a good benchmark for each industry across

[6] As the World Bank does not provide aggregated data on bank Z-score and NPL before 1999, we directly aggregate at country level the bank Z-score and NPL estimated at individual level from Bankscope for the 1989-1999 period. We also use bank assets in the total assets of the banking system as weights to compute the Z-score and NPL at country level.

countries. They calculate intangible intensity as the ratio of intangible assets to net fixed assets using Compustat data on US firms for the years immediately before our analysis period, 1980-1989.[7]

3.3.4. Country's Banking Development

We follow Rajan and Zingales (1998), Beck et al. (2000), and Kroszner et al. (2007), among others, and measure banking development (FD) as the ratio of private credit of deposit money banks to GDP taken from the World Bank Statistics Database. In our estimations, we focus on the exogenous component of countries' banking development and use the fitted values of an OLS in which regulatory and institutional national characteristics are the explanatory variables. Switzerland (154%) and Hong Kong (142%) are the countries that present the highest levels of banking development. The lowest values of banking development are in Iraq (2.24%) and El Salvador (3.99%).

3.3.5. Countries' Institutional Quality

We use the rule of law index (LAW) as a proxy for investor protection and institutional quality in a country. Higher values of this variable indicate higher efficiency in the application of laws. In our sample, the highest values for this variable are in Sweden, Norway, and New Zealand, among others. Countries like Cameroon or Algeria are the countries with the lowest levels of rule of law. We collected these data from The World Bank Institute's Governance Group. We examine the robustness of our results to alternative proxies: (1) the Kaufman et al. (2001) KKZ index, which is calculated as the average of six indicators: voice and accountability in the political system; political stability; government effectiveness; regulatory quality; rule of law; and control of corruption. (2) the property rights index constructed by the Heritage Foundation, which ranges from 1 to 5, where higher values indicate greater protection of property rights. Results are not significantly different using these alternatives.

3.3.6. Bank Competition, Concentration, and Ownership Relationships

We use the Lerner index, the Boone indicator, and bank market concentration as proxies for bank market competition. All these proxies are inversely related to bank competition and are

[7]We also check that the results do not change when we calculatean individual measure of intangible intensity for each industry in a specific country over the first period of our analysis (1989-1993), or first available, using firm-level data from Compustat.

obtained at country level from the GFDD. Original data come from Bankscope. The Lerner index (LERNER) is defined as the difference between output prices and marginal costs (relative to prices). Prices are calculated as total bank revenue over assets, whereas marginal costs are obtained from an estimated translog cost function with respect to output. The Lerner index takes 0 in the case of perfect competition and 1 under perfect monopoly. It has been widely and recently used in the banking sector as an indicator of the degree of market power (Beck et al., 2013). Table 1 shows that the Kyrgyz Rep. has the highest Lerner index over the 1989-2008 period (0.9548) whereas Kenya has the lowest (0.0154).

The Boone indicator (BOONE) is the elasticity of profits to marginal costs. To obtain the elasticity, the log of profits (measured by return on assets) is regressed on the log of marginal costs. The estimated coefficient is the elasticity. The rationale behind the indicator is that higher profits are achieved by more efficient banks. Hence, the more negative the Boone indicator is, the higher the degree of competition because the effect of reallocation is stronger. Estimations of the Boone indicator in the World Bank's database follow the methodology used by Schaeck and Čihák (2010) with a modification to use marginal costs instead of average costs. In our sample of countries, the Boone indicator has its highest value in Korea (2.2074) whereas Barbados has the lowest value (-2.0520).

Bank concentration (CONC) is defined as the ratio of the assets of the three largest commercial banks to total commercial banking assets in a country. Table 1 shows that Belize, Gabon, Iceland, New Zealand, Saint Lucia, Swaziland, and Tanzania present the highest values for bank concentration (100%). The least concentrated banking markets are in Luxembourg (27.79%), Panama (32.19%), or Japan (32.52%).

We also analyze the influence of two regulatory variables: legal restrictions to entry into the banking industry (ENTRY) and restrictions on the mixing of banking and commerce (RESTOWN).These regulatory variables come from the World Bank's Bank Regulation and Supervision database (Barth et al., 2006). ENTRY is based on whether or not the following information is required: (1) draft by-laws; (2) intended organizational chart; (3) financial projections for first 3 years; (4) financial information on main potential shareholders; (5) background/experience of future directors; (6) background/experience of future managers; (7) sources of funds to be used to capitalize the new bank; and (8) market differentiation intended for the new bank. Each type of information is assigned a value of 1 if it is required and 0 otherwise. Thus, higher values of this variable indicate stronger barriers to entry into

the banking industry. In our sample ENTRY ranges from a minimum value of 3 to a maximum value of 8.

RESTOWN is a proxy for ownership relationships between banks and their debtors. It indicates whether bank ownership and control of non-financial firms are: (1) unrestricted, (2) permitted, (3) restricted, or (4) prohibited. This variable ranges from a minimum value of 1 (Brazil, Netherlands or New Zealand, among others) to a maximum value of 4 (Bolivia, China or Singapore, among others). Higher values of RESTOWN indicate more restrictions and thus fewer potential bank-firm relationships.

INSERT TABLE 1 AND TABLE 2 ABOUT HERE

Table 3 shows the correlation matrix. We observe negative and significant relationships between the volatility of value added and $FD_{j,t}$, and between the industrial volatility and the $ZSCORE_{j,t}$. Moreover, the correlation between economic volatility and $NPL_{j,t}$ is positive and statistically significant. These results suggest that the higher the banking development and the higher the stability of the banking system, the lower the volatility of industrial value added. The relationship between industrial volatility and the measure of institutional quality (LAW_j) is negative and statistically significant, suggesting that higher levels of institutional quality in a country have positive effects on the stability of industrial economic performance. $BOONE_{j,t}$ correlates negatively to economic volatility, while the correlation with $CONC_{j,t}$ is positive and statistically significant. The volatility of industrial value added presents a positive relationship with the legal restrictions on banks' participation in the ownership and control of non-financial firms ($RESTOWN_{j,t}$), indicating that the greater the prohibition banks to participate in the capital of non-financial firms, the higher the economic volatility. The Lerner index ($LERNER_{j,t}$) and the index of legal entry requirements into the banking industry ($ENTRY_{j,t}$) present negative, although not statistically significant at conventional levels, correlations with the measure of industrial volatility.

INSERT TABLE 3 ABOUT HERE

4. Empirical Results

4.1. Banking Stability, Financial Development, and Economic Volatility

We now present the results for our basic model [1] explaining (1) how banking stability affects the volatility of industrial value added after controlling for financial development; and (2) the channels through which banking stability affects economic volatility. The results are reported in Table 4.We use the Z-score as proxy for banking stability in columns (2)-(5) and the ratio of non-performing loans in columns (6)-(9). ISHARE has negative and significant coefficients in all the estimations. It indicates that relatively larger sectors are less volatile. The negative and significant coefficient of $ED_i*FD_{j,t}$ in column (1) indicates that industries with higher levels of financial dependence tend to have lower levels of volatility of value added in countries with more developed financial systems. This result is consistent with previous findings by Larrain (2006), Raddatz (2006), and Beck et al. (2006). It suggests that greater availability of credit to sectors with more financial needs in countries with more developed banking systems helps stabilize industrial value added. It confirms that financial development reduces firms' dependence for investment on their internal funds and reduces the impact of real shocks on industry value added volatility.

In columns (2) and (6) we analyze the direct effect of banking stability on the volatility of industry value added. We obtain a negative and significant coefficient for the interaction term $BANKSTAB_{j,t}*ED_i$ when we use ZSCORE as proxy for banking stability and a positive coefficient when we use NPL in column (6). These coefficients indicate that higher banking stability is associated with lower volatility of industrial value added. Results remain invariant in columns (3) and (7) where we jointly consider the effect of both banking development and stability on industrial economic volatility. This result suggests that banking stability reduces economic volatility after controlling for banking development. However, it does not provide us with information on the channels through which this influence operates.

We examine in columns (4)-(5) and (8)-(9) the channels through which higher banking stability reduces volatility of industrial value added. To do this, we focus on the coefficients of two interaction terms: $BANKSTAB_{j,t}*ED_i*FD_{j,t}$ captures the impact of banking stability on economic volatility through its impact on credit supply; and $BANKSTAB_{j,t}*INTAN_i*LAW_j$ focuses on the effect through the asset allocation channel.

We obtain negative and significant coefficients of the interaction $BANKSTAB_{j,t}$* ED_i*$FD_{j,t}$ when the Z-score is the proxy for banking stability, and positive ones when we use the NPL in columns (8)-(9). These results are consistent with our first hypothesis and the relevance of the lending channel, i.e., banking stability reduces economic volatility by diminishing the volatility of the credit supply, especially in industries that are more dependent on external finance and in more developed banking systems. The interaction term $BANKSTAB_{j,t}$*$INTAN_i$*LAW_j has negative and significant coefficients in columns (4)-(5), and positive ones when we use NPL as a proxy for banking stability in columns (8)-(9). This result is consistent with our second hypothesis and the relevance of the asset allocation channel. Banking stability reduces economic volatility, especially in more intangible intensive industries and in countries with better investor protection.

Both the finance and the asset allocation effects are economically significant. Using, for instance, the result in column (5), a standard deviation increase in the Z-score of the national banking system would reduce the volatility of value added in an industry at the 75th percentile of external dependence and located in a country at the 75th percentile of financial development by 33 times more than in an industry at the 25th percentile of external dependence and located in a country at the 25th percentile of financial development.

Also using column (5) to estimate the economic impact of the asset allocation effect, an industry at the 75th percentile of intangible intensity and located in a country at the 75th percentile of investor protection experiences a 3.8 times greater reduction in the volatility of value added when there is an increase of one standard deviation in the banks' Z-score than in industries at the 25th percentile of intangible intensity and located at the 25th percentile of investor protection.

INSERT TABLE 4 ABOUT HERE

4.2. Influence of Bank Market Competition and Ownership Relationships

We now analyze whether the influence of banking stability on economic volatility, through both the lending channel and the asset allocation channel, varies across countries depending on bank market competition and ownership relationships between banks and non-financial firms. Specifically, we test how bank market power (LERNER and BOONE), concentration

(CONC), legal entry requirements into banking (ENTRY), and legal restrictions on bank ownership and control of non-financial firms (RESTOWN) shape the influence of the lending and asset allocation channels on economic volatility. We split the sample of industry-country observations around the median of each country variable. The results are reported in Table 5. Panel A shows the results when we use the Z-score as the proxy for banking stability whereas in Panel B we use NPL as the proxy inversely related to banking stability.

In the first four columns of both panels, we use the Lerner and Boone indexes to examine how bank market power affects the impact of banking stability on economic volatility. The results indicate that banking stability reduces economic volatility more in countries that have higher bank market power. The coefficients of both triple interaction terms ($ZSCORE_{j,t}$*ED_i*$FD_{j,t}$ and $ZSCORE_{j,t}$*$INTAN_i$*LAW_j) are significant in countries with a Lerner or Boone indicator above the median of the sample in columns (1) and (3). The significant coefficients are negative when we use the banks' Z-score (Panel A) and positive when we use the ratio of non-performing loans (Panel B) as the proxy for banking stability. These results indicate the relevance of the lending and asset allocation effects of banking stability on economic volatility in countries with relatively high bank market power. However, in countries with a Lerner and Boone indicator below the median in the sample, the coefficients of the triple interaction terms are not significant or less significant. In Panel A, using the Z-score as the proxy for banking stability, we do not obtain significant coefficients for $ZSCORE_{j,t}$*ED_i*$FD_{j,t}$ in columns (2) or (4), suggesting that banking stability does not reduce economic volatility by diminishing the volatility of credit supply in countries with a bank market power below the median of the sample. The coefficient of $ZSCORE_{j,t}$*$INTAN_i$*LAW_j is significant in column (4) but not in column (2). In Panel B, none of the coefficients of the two triple interaction terms are significant in countries with a bank market power below the median when we use the Lerner index as the proxy for bank market power in column (2). We only obtain the expected positive coefficient of the interaction $NPL_{j,t}$*ED_i *$FD_{j,t}$ when we use the Boone indicator as the proxy for banking stability.

We obtain similar results when we use CONC and ENTRY as indirect proxies, inversely related, to bank market competition in columns (5) to (8). In countries with bank concentration or bank entry requirements above the median, we obtain negative and significant coefficients for both triple interaction terms in Panel A and positive coefficients in Panel B. However, in the sub-sample of countries with bank concentration or bank entry

requirements below the median, we do not obtain significant coefficients for the triple interaction terms capturing the lending effect, and only the triple interaction term capturing the asset allocation effect has significant coefficients.

These results of our proxies for bank market competition support hypothesis 3 because they suggest that greater bank market power or less banking competition increase both the lending and asset allocation effects of banking stability on economic volatility. This finding is consistent with bank market power enhancing lending relationships between banks and industrial firms that originate switching costs for firms and influence investment by firms in case of banks' balance-sheet shocks (the lending effect). Moreover, if greater bank market power and close lending relationships facilitate bank funding for intangible assets, greater market power could also explain a higher impact of bank stability on economic volatility through the asset allocation channel.

The evidence is weaker when we focus on the influence of ownership relationships between banks and industrial firms. We do not find significant differences in the lending channel effect across countries depending on countries' legal restrictions on bank ownership and control of non-financial firms (RESTOWN). The coefficients of the interaction term $ZSCORE_{j,t}*ED_i*FD_{j,t}$, are negative in both columns (9) and (10). Similarly, the coefficients of $ZSCORE_{j,t}*ED_i*FD_{j,t}$ are positive in both columns of Panel B. We only find differences in the asset allocation effect of bank stability in Panel B when we use NPL as the proxy for banking stability. The coefficient of $ZSCORE_{j,t}*INTAN_i*LAW_j$is positive and significant in column (10) but not in column (9). It indicates that bank incentives impact on risk-taking by firms only in countries with lower restrictions on bank ownership of non-financial firms. Mixing banking and commerce increases the impact of banking stability on economic volatility through the asset allocation effect. It is consistent with bank risk-taking incentives affecting risk-taking by firms more if banks can have equity stakes in firms.

INSERT TABLE 5 ABOUT HERE

4.3. Systemic Banking Crises and Economic Volatility

We now empirically analyze the influence of a systemic banking crisis on the volatility of industrial value added. Systemic banking crises can be considered an ex-post measure of banking instability in a country and we use it as an alternative proxy to Z-score and NPL for banking stability. Obviously, banking crises would be inversely related to bank stability.

Using the information on financial crises provided by the Laeven and Valencia (2012) database, we identify a total of 71 episodes of systemic and borderline banking crises occurred in 66 developed and developing countries over the global sample period 1989-2008.We check that results do not change when only systemic banking crises are considered and when we omit information about the recent crisis. Information on banking crisis inception dates is provided in Table 1.

Results are reported in Table 6. In Panel A, we define a crisis dummy variable (CRISIS) that takes value 1 in the period in which the country has experienced a systemic or borderline banking crisis and the following periods. CRISIS takes value 0 when a country has not experienced a banking crisis or in the periods before a systemic banking crisis if the country has experienced one. In Panel B, we define CRISIS as a dummy variable that takes value 1 in the period in which the country has experienced a banking crisis, and 0 otherwise.

The results are consistent with those reported in Table 4presented in the above sections. We obtain a negative and significant coefficient for the interaction term $ED_i*FD_{j,t}$ in all the estimations, indicating that industries with higher levels of financial dependence tend to have lower levels of volatility of value added in countries with more developed financial systems. The coefficient of the interaction $CRISIS_{j,t}*ED_i$ is positive and statistically significant and suggests that the volatility of value added in industries that depend more on external finance is higher in countries experiencing an episode of banking distress. The result is consistent with that obtained by Dell'Ariccia et al. (2008). These authors show that banking crises have a more negative effect on economic growth in industries that are most in need of external finance. We now show that this kind of industry suffers most from the negative consequences of a crisis in terms of lower stability of value added.

In columns (2)-(4) and (6)-(8) we look at the channels through which banking crises affect the volatility of industrial value added. We obtain a positive and statistically significant coefficient for the triple interaction term $CRISIS_{j,t} * ED_i*FD_{j,t}$ in all the estimations. It indicates that crisis periods affect the economic volatility of more financially-dependent industries more positively in countries with higher levels of financial development. The result is consistent with that presented in Table 4 for the bank Z-score. According to Kroszner et al. (2007), if industries that depend more on external finance are hurt more severely after a banking crisis, then a banking crisis is likely to have an independent negative effect on real economic activity. Following this reasoning, operating in an environment where the banking

market is well-developed is an advantage for more financially-dependent industries in good times, but a disadvantage (in terms of higher economic volatility) in times of banking crises. In terms of the asset allocation channel, we obtain a positive coefficient for the interactive term $CRISIS_{j,t}*INTAN_i*LAW_j$ in all the estimations. This result is consistent with previous results and suggests that crisis periods increase the economic volatility of industries more if they are more intensive in intangible assets and are in countries with higher institutional quality.

INSERT TABLE 6 ABOUT HERE

4.4. Robustness Checks

We now compare our approach with the previous literature analyzing how banking development influences economic volatility. The most related paper is Beck et al. (2006) analyzing whether banking development magnifies or dampens real and monetary shocks. They associate monetary shocks with impacts on banks' balance sheets. So their monetary shocks would be similar to our lending effect of banking stability because both of them affect economic volatility through changes in credit supply. They do not consider the asset allocation effect of banking stability and do not use direct measures of banking stability. Their model specification using country data is:

$$SD\_GROWTH_{j,t} = \alpha_0 + a_1 SD\_\Delta TOT_{j,t} + \alpha_2 SD\_INF_{j,t} + \alpha_3 FD_{j,t} + \alpha_4 FD_{j,t} * SD\_\Delta TOT_{j,t} + \\ + \alpha_5 FD_{j,t} * SD\_INF_{j,t} + \varepsilon_{j,t} \quad [2]$$

The dependent variable is the standard deviation of real per capita GDP of country j in period t, calculated over three-year periods ($SD\_GROWTH_{j,t}$). $SD\_\Delta TOT_{j,t}$ is the standard deviation of trade changes. Terms of trade volatility attempts to capture changes in the terms of trade associated with changes in input prices or technologies affecting the production function, which in turn lead to changes in the level of productivity of the economy. $SD\_INF_{j,t}$ is the standard deviation of inflation. Monetary volatility refers to changes in monetary policies affecting interest rates, credit supply to the private sector and, therefore, economic performance. $FD_{j,t}$ is the proxy for financial development in a country.

We use their variables for real and monetary shocks in our sample of industrial data and control for our industry, country, and period effects. $SD\_\Delta TOT_{i,j,t}$ and $SD\_INF_{i,j,t}$ are calculated for our periods of analysis using data from the World Development Indicators (WDI)database. In column (1) of Table 7, we simply replicate the basic model of Beck et al. (2006). We confirm their finding that financial development dampens the impact of real shocks (the coefficient of $SD\_\Delta TOT_{i,j,t}*FD$ is negative) but magnifies the impact of monetary shocks (the coefficient of $SD\_INF_{i,j,t}*FD_{j,t}$ is positive). In column (2) we only include ISHARE and country-industry, country-year, and industry-year fixed effects as control variables. The influence of banking development in reducing the impact of real shocks and increasing the impact of monetary shocks on economic volatility does not change. It is consistent with our fixed effects controlling for differences across countries on banking development and real and monetary shocks, which allows us to focus on the interaction terms. The results in columns (3) and (4) show additional robustness checks of these results.

Columns (5) to (7) test the relevance of the lending and asset allocation channels using similar proxies for real and monetary shocks and set-up to those used by Beck et al. (2006). In these columns, we extend their model to incorporate our controls for reverse causality (interactions with ED) and the asset allocation effect of banking stability. The positive coefficients $SD\_INF_{i,j,t}*ED_i*FD_{j,t}$ and $SD\_INF_{i,j,t}*INTAN_i*LAW_j$ in column (5) confirm, respectively, the relevance of the lending and asset allocation effects as channels through which banking stability reduces the volatility of industry value added. The results are similar in column (7) when we use the interaction term $SD\_\Delta TOT_{i,j,t}*ED_i*FD_{j,t}$ instead of $ED_i*FD_{j,t}$ to control for the influence of banking development in reducing the impact of real shocks on economic volatility.

In a further analysis, we make additional checks for the robustness of the results. First, we check that the results are robust to alternative definitions of the set of instruments for the interaction terms of banking stability and financial development. For instance, we check that results do not vary when we use additional institutional variables as instruments, such as an index measuring the quality of protection of property rights and the KKZ index. Following Claessens and Laeven (2003), we use the rating of protection of property rights constructed by the Heritage Foundation. It ranges from 1 to 5, where higher values indicate greater protection of property rights. We also introduce the KKZ index calculated as the average value of the six indicators of governance provided by The World Bank Institute's

Governance Group: Voice and Accountability, Political Stability and Absence of Violence, Government Effectiveness, Regulatory Quality, Rule of Law, and Control of Corruption (Kaufman et al., 2001). Second, we also consider the provisions for problematic loans to total gross loans as an alternative proxy for banking stability. The results obtained are similar to those reported.[8]

5. Conclusions

Previous banking literature has documented the positive role of financial development for fostering stability in the real economic sector. We provide additional empirical evidence on the relevance of the financial sector for promoting lower levels of economic volatility. In particular, we examine the impact of banking stability on the volatility of industrial value added in 23 industrial sectors located in 110 developed and developing countries over the 1989-2008 period. We control for financial development, endogeneity of banking stability, and reverse causality problems between banking stability and volatility of industrial value added. Our results indicate that banking stability reduces the volatility of industrial value added through two channels: the *lending channel* and the *asset allocation channel*.

Banking instability increases the volatility of credit supply. In imperfect capital markets, firms cannot totally substitute banks' funds if banks reduce credit supply so that debtors are obliged to reduce investment. In this situation, higher volatility of credit supply would increase economic volatility through the lending effect. This lending effect is more relevant in industries with more external financial needs in countries with more developed banking markets.

The asset allocation effect is related to the effect of higher bank risk-taking incentives on firms' risk-taking. The less risk-averse banks are, the less reluctant they are to accept riskier behavior by their debtors. This higher risk-taking behavior by firms promoted by less risk-averse behavior by banks would increase economic volatility. Our results highlight that banking stability promotes economic volatility in industries that are more intensive in intangible assets and in countries with higher institutional quality. Higher quality of institutions increases firms' incentives to take risk and may explain why bank risk fosters greater risk-taking by firms in these countries.

[8] All the robustness tests are available from the authors upon request.

The effect of banking stability on economic volatility through the two channels varies across countries depending on bank market competition and bank-firm relationships. We find that banking stability contributes more to reducing the volatility of industrial value added in countries with higher bank market power, higher bank concentration, stricter restrictions on bank entry and fewer legal restrictions on bank ownership of non-financial firms.

Our results have some policy implications. If economies intend to increase growth rates by promoting innovation and investment in intangible assets, it will be increasingly important to avoid banking instability as this would be increasingly harmful for real economic stability. Moreover, our results highlight that bank market competition and bank-firm relationship not only influences banking stability, as the literature has extensively shown, but also the impact of banking stability on economic volatility through both the lending and asset allocation channels.

References

Barth, J.R., Caprio, G., and Levine, R., (2004):"Bank Regulation and Supervision: What Works Best?". Journal of Financial Intermediation, 13, 205-248.

Barth, J.R., Caprio, G., Levine, R., (2006): "Rethinking Bank Regulation: Till Angels Govern". Cambridge University Press, New York.

Beck, T., De Jonghe, O., Schepens, G., (2013): "Bank Competition and Stability: Cross-Country Heterogeneity". Journal of Financial Intermediation, 22, 218-244.

Beck, T., Levine, R., Loayza, N. (2000): "Finance and the Sources of Growth". Journal of Financial Economics 58, 261-300.

Beck, T., Lundberg, M., Majnoni, G., (2006): "Financial Intermediary Development and Growth Volatility: Do Intermediaries Dampen or Magnify Shocks?". Journal of International Money and Finance, 25, 1146-1167.

Boyd, J. H., De Nicolo, G., (2005): "The Theory of Bank Risk-Taking and Competition Revisited", Journal of Finance, 60, 1329-1343.

Braun, M., Larrain, B., (2005): "Finance and the Business Cycle: International, Inter-industry Evidence". The Journal of Finance, 60, 1097-1128.

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

Claessens, S., Laeven, L., (2003): “Financial Development, Property Rights, and Growth”. The Journal of Finance, 58, 2401-2436.

Claessens, S., Laeven, L., (2005): “Financial Dependence, Banking Sector Competition and Economic Growth”. Journal of the European Economic Association, 3, 179-213.

Dell’Ariccia, G., Detragiache, E., Rajan. R., (2008): “The Real Effects of Banking Crises”. Journal of Financial Intermediation, 7, 89-112.

Denizer, C., Iyigun, M.F., Owen, A.L., (2002): “Finance and Macroeconomic Volatility”. Contributions to Macroeconomics 2, Article 7.

Detragiache, E., Garella, P., Guiso, L., (2000): “Multiple versus Single Banking Relationships: Theory and Evidence”. The Journal of Finance, 55, 1133-1161.

Easterly, W., Islam, R., Stiglitz, J., (2000): “Shaken and Stirred: Explaining Growth Volatility”. In: Annual World Bank Conference on Development Economics 2000, 191-211.

Fernández, A.I., González, F., Suárez, N., (2013a): “How Bank Competition, Regulation, and Institutions Shape the Real Effects of Banking Crises? International Evidence”. Journal of International Money and Finance, 33, 19-40.

Fernández, A.I., González, F., Suárez, N., (2013b): “The Real Effect of Banking Crises: Finance or Asset Allocation Effects? Some International Evidence”. Journal of Banking and Finance, 37, 2419-2433.

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

Giannetti, M., Ongena, S., (2009): “Financial Integration and Firm Performance: Evidence from Foreign Bank Entry in Emerging Markets”. Review of Finance, 13, 181-223.

Houston, J.F., Chen, L., Ping, L., Yue, M., (2010): “Creditor Rights, Information Sharing, and Bank Risk Taking”. Journal of Financial Economics, 96, 485-512.

John, K., Lubomir, L., Yeung, B., (2008): “Corporate Governance and Risk-Taking”. The Journal of Finance, 68, 1679-1728.

Kaufman, D., Kraay, A., Zoido-Lobaton, P., (2001): “Governance Matters II: Update Indicators for 2000/01”. World Bank.

Keeley, M.C., (1990): “Deposit Insurance Risk and Market Power in Banking”, American Economic Review, 80, 1183-1200.

Kick T., Prieto, E., (2014): “Bank Risk and Competition: Evidence from Regional Banking Markets”. Review of Finance, doi:10.1093/rof/rfu019.

Klomp, J., de Haan, J., (2009): “Political Institutions and Economic Volatility”. European Journal of Political Economy, 25, 311-326.

Kroszner, R.S., Laeven, L. Klingebiel, D., (2007): “Banking Crises, Financial Dependence and Growth”. Journal of Financial Economics, 84, 187-228.

La Porta, R., López-de-Silanes, F., Shleifer, A., Vishny, R., (2000): “Investor Protection and Corporate Governance”. Journal of Financial Economics, 58, 3-27.

Laeven, L., Levine, R., (2009): “Bank Governance, Regulation and Risk Taking”. Journal of Financial Economics, 93, 259-275.

Laeven, L., Valencia, F., (2012): “Systemic Banking Crises Database: An Update”. IMF Working Paper, WP/12/163.

Larrain, B., (2006): “Do Banks affect the Level and Composition of Industrial Volatility?”. The Journal of Finance, 61, 1897-1926.

Levine, R., (2005): “Finance and growth: theory and evidence.” in Handbook of Economic Growth, Eds.: Aghion, P. and Durlauf, S., The Netherlands: Elsevier Science.

Petersen, M.A., (2009): “Estimating Standard Errors in Finance Panel Data Sets: Comparing Approaches”. Review of Financial Studies, 22, 435-480.

Petersen, M. A., Rajan, R. G., (1994): “The Benefits of Lending Relationships: Evidence from Small Business Data”. Journal of Finance, 49, 1367-1400.

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

Raddatz, C., (2006): “Liquidity Needs and Vulnerability to Financial Underdevelopment”. Journal of Financial Economics, 80, 677-722.

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

Schaeck, K., Cihak, M., (2010): “Competition, Efficiency, and Soundness in Banking: An Industrial Organization Perspective”. European Banking Center Discussion Paper No. 2010-20S

Table 1. Descriptive Statistics. Country-Level Information

This table shows the mean values of the main variables by country and the information about the inception dates of the 71 crisis episodes that occurred during the 1989-2008 period. Volatility VA is the standard deviation (relative) of the industrial value added (in natural logarithms). FD is a measure of financial development and is defined as the ratio of bank private credit from commercial banks-to-GDP. ZSCORE is the natural logarithm of bank Z-score, a proxy for insolvency risk that equals the return on assets plus the capital asset ratio divided by the standard deviation of asset returns. NPL is the percentage of non-performing loans over total gross loans. LAW is the rule of law index. LERNER is the Lerner index. BOONE is the Boone indicator. LERNER and BOONE are proxies for bank market power. CONC is bank concentration, measured as the fraction of the assets of the three largest banks as a share of the assets of all commercial banks in a country. ENTRY is an index that measures the legal restrictions to entry into the banking industry. RESTOWN measures the legal restrictions on bank ownership and control by non-financial firms. The sample consists of 110 developed and developing countries during the 1989 – 2008 period. Industrial information comes from the UNIDO database. Country-level financial information is collected from the World Bank Statistics Database. Information on institutional variables is from The World Bank Institute's Governance Group. Regulatory variables come from the Barth et al. (2006) database. Information on banking crises inception dates comes from the Laeven and Valencia (2012) database.

COUNTRY	Banking Crises Date	Volatility VA (Log.)	FD (%)	ZSCORE	NPL(%)	LAW	LERNER	BOONE	CONC	ENTRY	RESTOWN
Albania	1994	-1.0310	8.9761	1.0814	4.2600	-0.1171	0.1433	-0.0746	96.4009	8	3
Algeria	1990	-0.9967	14.8732	1.0987	n.a.	-1.2130	0.2318	-0.0283	91.4529	7	3
Argentina	1989, 1995	-0.0208	16.0253	0.8327	8.3333	0.1122	0.2340	-0.1514	34.3766	7	3
Australia	n.a.	-0.5544.	77.9046	1.0875	0.6133	1.8120	0.1700	-0.1889	55.2965	8	2
Austria	2008	-0.9636	98.0067	1.5348	2.5150	1.9054	0.2210	-0.0344	80.1006	8	2
Bangladesh	n.a.	-1.4219	25.7188	0.6329	29.9133	-0.7749	0.0860	0.0353	64.2269	n.a.	n.a.
Barbados	n.a.	-0.1858	53.1697	0.9993	n.a.	-0.2407	n.a.	-2.0520	98.1895	n.a.	n.a.
Belarus	1995	-1.5939	9.8210	0.8185	6.0300	-0.9287	0.3825	-0.0255	94.9990	6	2
Belgium	2008	-0.9498	69.0287	1.0681	2.4400	1.5480	0.2059	0.0269	74.1383	8	2
Belize	n.a.	-0.7526	41.8510	1.4416	n.a.	0.7929	n.a.	-0.0303	100	8	2
Bolivia	1994	-0.7016	41.7397	1.1700	8.9600	-0.2890	0.2756	-0.1529	46.9582	8	4
Botswana	n.a.	-1.0513	13.9197	1.1311	1.7000	0.6243	0.5089	-0.0373	98.8207	8	2
Brazil	1990, 1994	-0.5959	32.8792	0.9106	6.5466	-0.2142	0.3751	-0.1042	39.9305	8	1
Bulgaria	1996	-0.3712	38.1601	0.7896	6.4200	-0.1122	0.2320	-0.3344	86.9544	8	2
Burundi	1994	-1.3335	14.1476	1.1822	n.a.	-0.8774	0.2120	0.0167	88.9460	8	3
Cameroon	1995	0.3975	11.7518	0.9542	n.a.	-1.4972	n.a.	-0.0217	83.4034	8	2
Canada	n.a.	-1.3325	93.6822	1.3789	1.0066	1.7634	0.2133	-0.0031	39.3160	8	2
Central African Rep	1995	1.8930	5.5362	0.6008	n.a.	-0.2849	n.a.	n.a.	n.a.	8	2
China	1998	0.3517	94.4337	1.2632	16.0750	-0.2514	0.3843	-0.0566	56.9261	6	4
China, Hong Kong	n.a.	-1.2547	142.0347	1.2420	4.2133	1.1419	0.3494	-0.0221	47.4374	6	2
Colombia	1998	-1.4855	26.0906	0.8877	7.9400	-0.6695	0.2629	0.0340	35.1974	8	3
Congo Rep.	1992	-0.5744	7.5458	0.9644	n.a.	n.a.	0.2742	n.a.	n.a.	n.a.	n.a.
Costa Rica	1994	-1.1110	21.1160	1.3298	2.5667	0.5731	0.2587	-0.0803	86.8226	8	4
Côte d'Ivoire	n.a.	0.8554	20.2979	1.1540	n.a.	-0.6851	0.3199	-0.0440	86.1224	8	3
Croatia	1998	0.0701	39.6786	0.9186	8.0866	-0.5647	0.0765	-0.0329	52.2025	7	2
Cyprus	n.a.	-1.2315	138.4956	3.0520	3.6000	0.7600	0.1844	0.1665	82.4479	6	3
Czech Rep.	1996	-1.2945	48.6932	0.7921	13.1000	0.8678	0.2980	-0.0895	76.1430	8	3
Denmark	2008	-1.3601	90.6305	1.11710	0.8083	1.8736	0.1823	-0.0761	79.9724	8	3
Ecuador	1998	-0.6828	22.1987	0.8484	10.0200	-0.4239	0.5268	0.2338	94.4290	8	4
Egypt, Arab Rep.	n.a.	-0.7991	38.2563	1.4788	19.6025	0.0770	n.a.	-0.0755	55.9305	8	3
El Salvador	1989	-0.7091	3.9972	1.3841	2.8667	-0.9087	0.0946	-0.1623	92.7750	8	4
Estonia	1992	-0.5604	34.5449	0.9158	1.0200	0.5051	0.1647	-0.1566	84.9947	8	2
Ethiopia	n.a.	0.1553	12.6141	0.7834	n.a.	-0.9423	0.2849	-0.0236	94.8891	n.a.	n.a.
Fiji	n.a.	-0.6190	34.5023	0.8911	n.a.	0.2167	n.a.	n.a.	n.a.	7	n.a.
Finland	1991	-1.0951	68.7033	1.1411	0.7200	1.9047	0.2388	-0.1648	90.0564	6	2
France	n.a.	-1.0050	88.9332	1.2670	4.8200	1.4694	0.0847	-0.0679	50.9603	6	2
Gabon	n.a.	0.3468	9.1616	1.1242	10.9275	-0.9281	n.a.	-0.0357	100	8	2
Georgia	1991	-0.8125	9.2803	1.0262	4.8000	-0.8365	0.5365	-0.0771	75.9528	n.a.	n.a.
Germany	2008	-1.4673	105.0687	1.3867	4.3066	1.7916	0.3038	-0.0422	60.8039	7	2
Greece	2008	-1.3542	47.4952	0.7716	9.6000	0.9447	0.2724	0.0768	78.7906	7	2
Honduras	n.a.	-1.2948	32.3087	1.0551	8.6333	-0.7455	0.1346	-0.0821	51.8589	8	3
Hungary	1991, 2008	-0.8975	36.2131	0.9112	3.5200	0.8400	0.0425	-0.1106	60.8105	8	3
Iceland	2008	-1.1509	99.7969	0.1805	1.7711	1.6368	0.3371	0.3349	100	8	2
India	1993	-1.3295	27.8956	1.2421	10.0733	0.2942	0.2960	-0.1079	35.2846	6	3
Indonesia	1997	-0.6614	33.5201	0.6436	26.5666	-0.3666	0.4222	0.0695	41.8002	n.a.	n.a.
Iran	n.a.	-0.7168	21.0447	1.1179	n.a.	-0.9773	0.2604	0.0212	n.a.	n.a.	n.a.
Iraq	n.a.	0.4069	2.2420	0.7820	n.a.	-1.6104	n.a.	-0.0074	91.6376	n.a.	n.a.
Ireland	2008	-0.5979	93.4710	0.8345	1.1000	1.7142	0.4161	-0.0170	74.2916	n.a.	2
Israel	n.a.	-0.7423	70.6800	1.4471	5.6950	1.2208	0.2369	-0.1381	73.9618	3	3
Italy	2008	-1.4049	68.6802	1.1695	8.4733	0.9804	0.2816	-0.0462	51.7879	8	2
Jamaica	1996	-0.6976	20.8116	0.6753	11.000	-0.2970	0.3644	0	83.2784	n.a.	n.a.
Japan	1997	-0.7249	150.0018	1.0443	4.5533	1.5306	0.0142	-0.0244	32.5214	7	3
Jordan	1989	-0.7705	68.0916	1.6794	11.3133	0.4439	0.3617	-0.0883	87.9472	7	3
Kenya	1992	-0.5064	22.6883	0.9901	24.0167	-1.0563	0.0154	-0.1228	55.5506	7	3
Kuwait	n.a.	-0.4676	42.9515	1.4448	8.8200	0.7376	0.1779	-0.2044	68.0861	6	2
Kyrgyz Rep.	1995	-1.1001	6.1315	1.2759	5.0333	-0.6406	0.9548	-0.0542	83.3545	8	2
Latvia	2008	-0.9802	33.8080	0.6321	3.5667	0.1312	0.2443	0.1112	48.3698	8	2
Lithuania	1995	0.7805	22.9431	0.5605	7.5800	0.2943	0.4347	0.2328	82.7638	8	2
Luxembourg	2008	-1.0262	110.8394	1.3740	0.4266	1.6092	0.1279	-0.0412	27.7970	8	3
Madagascar	n.a.	-1.2781	10.6793	0.8309	8.6000	-0.9717	0.2800	-0.0074	88.0090	7	3
Malawi	n.a.	-0.3072	6.2054	0.9942	n.a.	-0.5540	0.5663	-0.0912	93.4230	n.a.	n.a.
Malaysia	1997	-1.0610	108.8048	1.2948	14.2333	0.7308	0.2685	-0.0161	42.6060	7	3
Malta	n.a.	-0.6684	94.9482	1.1748	9.4700	0.4303	0.4190	-0.0750	94.7468	8	3
Mauritius	n.a.	-1.1176	50.9256	1.1398	6.7166	0.7588	0.2236	-0.1508	88.1370	7	2
Mexico	1994	-0.6719	18.8047	1.0671	6.2866	-0.5064	0.2520	-0.3157	68.2782	8	3
Mongolia	2008	-0.1578	13.4382	1.4422	n.a.	0.0684	0.3654	-0.0678	96.2425	n.a.	n.a.
Morocco	n.a.	-0.6728	38.9860	1.4933	14.5600	0.1244	0.0481	-0.0272	51.2471	8	3

Nepal	n.a.	-0.9592	22.3028	1.0727	n.a.	n.a.	0.4537	-0.0846	75.3321	n.a.	n.a.
Netherlands	2008	-1.3744	118.2334	1.3510	2.1466	1.8128	0.3014	-0.0657	82.7982	8	1
New Zealand	n.a.	-0.9174	98.9654	1.2899	n.a.	1.9678	0.2061	-0.8247	100	6	1
Niger	n.a.	0.7209	7.5330	1.1094	n.a.	-0.8860	0.0618	-0.0263	91.7854	8	3
Nigeria	n.a.	-0.0947	12.2506	0.7063	17.7533	-1.3500	0.2020	-0.1103	33.0847	8	3
Norway	1991	-0.7475	65.0625	0.9856	1.2000	2.0251	0.1437	-0.0848	85.2153	8	2
Oman	n.a.	-0.3395	34.0696	1.1945	7.1516	0.8690	0.1791	-0.0591	58.1995	8	3
Pakistan	n.a.	-1.8706	23.5839	0.9077	16.4066	-0.5911	0.3499	-0.2042	65.9154	7	3
Panama	n.a.	-1.5988	68.1749	1.4081	2.0950	-0.1548	0.1192	-0.0438	32.1999	8	2
Paraguay	1995	-1.6272	21.7426	1.1764	9.7416	-0.4610	0.4303	-0.3171	44.7598	7	2
Peru	n.a.	-1.0660	16.0945	1.2531	7.3283	-0.5796	0.3141	-0.0714	59.1234	7	2
Philippines	n.a.	-0.9944	28.8389	1.4854	13.4133	-0.0246	0.4347	-0.0718	76.3924	8	2
Poland	1992	-0.4998	23.5731	0.9675	12.2916	0.6398	0.3708	-0.1397	60.0263	7	1
Portugal	2008	-1.0823	97.3599	1.2885	2.6916	1.1366	0.3768	-0.0590	51.8338	7	3
Qatar	n.a.	-0.4818	27.5282	1.6310	n.a.	0.1035	0.2896	-0.0171	92.5370	4	3
Rep. of Korea	1997	-0.7551	66.2643	0.9555	4.5533	0.6964	0.3194	2.2074	65.6183	8	3
Rep. of Moldova	n.a.	-0.8792	n.a.	1.1715	n.a.	-0.1030	0.3242	n.a.	n.a.	8	2
Romania	1990	-0.6768	12.9461	0.7950	5.8200	-0.1535	0.1851	-0.2679	83.4536	8	3
Russian Fed.	1998, 2008	-0.6405	16.5706	0.7205	9.2666	-0.7285	0.0252	-0.0840	61.7168	7	2
Saint Lucia	n.a.	-0.0476	67.0291	1.1135	n.a.	-0.3314	n.a.	-0.0436	100	8	2
Senegal	n.a.	-0.3027	20.2053	1.2003	16.1925	-0.3885	0.0199	-0.0465	75.4049	8	3
Serbia	n.a.	-0.5156	25.0071	1.1281	18.4083	-0.9848	0.2360	-0.0944	92.5099	7	2
Singapore	n.a.	-0.9977	90.9672	1.4352	4.5900	1.7379	0.3350	0.8436	75.0449	8	4
Slovak Rep.	1998	-0.6871	40.8661	0.9006	15.7200	0.2268	0.2591	0.4054	64.3816	8	3
Slovenia	1992, 2008	-1.0900	34.5603	1.0576	4.4861	0.8662	0.0468	-0.0444	60.7522	7	3
South Africa	n.a.	-1.3614	60.5318	1.3518	3.1416	0.2611	0.2514	-0.0231	81.4810	6	2
Spain	2008	-1.2821	99.6392	1.4111	1.4733	1.3542	0.3754	-0.0578	75.0458	8	1
Sri Lanka	1989	-0.7049	23.0053	1.0905	n.a.	-0.1195	0.2629	-0.07353	77.8773	8	3
Swaziland	1995	-1.2277	15.6046	0.6764	4.7000	0.7929	0.1109	-0.3629	100	7	4
Sweden	1991	-0.5604	65.7767	1.0519	1.6933	1.8365	0.0901	-0.0329	94.4365	8	1
Switzerland	2008	-1.6959	154.6156	1.1334	2.8666	2.0804	0.3481	-0.0619	86.2603	8	2
Syrian Arab. Rep.	n.a.	-0.7434	9.2433	0.5898	n.a.	-0.4874	n.a.	-0.0785	91.2484	n.a.	n.a.
Thailand	n.a.	-0.4158	106.5131	-0.1325	23.6666	0.5820	0.4524	-0.1115	48.4175	8	3
The Yugosl. Rep. Macedonia	1993	0.1831	n.a.	1.1303	n.a.	-0.1540	0.3405	n.a.	n.a.	8	2
Trinidad and Tobago	n.a.	-0.8439	28.7996	1.2154	n.a.	0.5360	0.2735	-0.0975	71.7196	3	2
Tunisia	1991	-1.0038	53.1517	1.4652	21.0500	-0.2020	0.3379	0.0179	46.3998	8	3
Turkey	n.a.	-1.1757	16.0700	0.6402	8.6066	-0.0128	0.1613	0.3588	55.4169	7	2
Uganda	1994	-0.9390	5.2084	0.8499	10.2066	-0.6416	n.a.	-0.0353	54.9132	n.a.	n.a.
United Kingdom	2007	-1.4393	126.6779	1.0945	2.3666	1.8279	0.2870	-0.0561	61.5912	8	1
United Rep. of Tanzania	n.a.	-1.0388	5.9572	0.9088	24.0500	-0.4229	0.4678	0	100	n.a.	n.a.
Uruguay	2002	-0.8602	30.2029	0.3500	10.2725	0.5571	0.1063	-0.2252	48.3848	7	4
Vietnam	1997	-0.9394	39.8182	1.2444	n.a.	-0.6483	0.3017	-0.0559	84.7007	n.a.	n.a.
Yemen, Rep.	1996	-1.1227	4.9534	1.0921	n.a.	-1.1471	n.a.	-0.0149	95.1194	n.a.	n.a.
#Total / Mean	71	-0.8476	46.0077	1.0789	8.4024	0.2461	0.2865	-0.0896	72.3924	7.3085	2.5565

Table 2. Descriptive Statistics. Industry-Level Information

This table shows the mean values of the industry-level variables. Volatility VA is the standard deviation (relative) of the industrial value added (in natural logarithms). ED is the measure of external financial dependence calculated in Rajan and Zingales (1998). INTAN is the ratio intangible assets-to-net fixed assets calculated in Claessens and Laeven (2003) for US data. The sample consists of 23 industrial sectors from 110 developed and developing countries analyzed during the 1989 – 2008 period. Industrial information on value added comes from the UNIDO database.

Industry (ISIC Classification)	ISIC-Code	Volatility VA (Log.)	ED	INTAN
Basic Metals	27	-0.7711	0.09	0.11
Chemicals and Chemical Products	24	-0.8092	0.63	0.96
Coke, Petroleum, and Nuclear	23	-0.6655	0.04	0.02
Electrical Machinery and Apparatus	31	-0.8260	0.77	0.77
Fabricated Metal Products	28	-0.8873	0.24	0.31
Food and Beverages	15	-0.8930	0.11	0.75
Furniture; Manufacturing n.e.c.	36	-0.8004	0.24	0.49
Leather	19	-1.0550	-0.14	0.33
Machinery and Equipment	29	-0.8474	0.45	0.25
Medical, Precision and Optical Instruments, Watches and Clocks	33	-0.8180	0.96	0.90
Motor Vehicles, Trailers and Semi-Trailers	34	-0.7768	0.39	0.24
Office, Accounting, and Computing Machinery	30	-0.6849	1.06	0.25
Other Non-Metallic Mineral Products	26	-0.8446	0.06	0.05
Other Transport Equipment	35	-0.9480	0.31	0.24
Paper and Paper Products	21	-0.8810	0.18	0.20
Publishing, Printing, and Reproduction	22	-0.7978	0.20	4.54
Radio, television and Communication Equipment and Apparatus	32	-0.8504	1.04	0.77
Recycling	37	-0.8075	0.47	2.29
Rubber and Plastic Products	25	-0.9027	0.68	0.46
Textiles	17	-0.8863	0.40	0.21
Tobacco	16	-0.7929	-0.45	0.49
Wearing	18	-0.8761	0.03	0.53
Wood and Wood Products	20	-0.8361	0.28	1.20
Total		-0.8389	0.3495	0.7113

Table 3. Correlations

The table presents the correlation matrix. Volatility VA is the standard deviation (relative) of the industrial value added (in natural logarithms). FD is a measure of financial development and is defined as the ratio of bank private credit from commercial banks-to-GDP. ZSCORE is the natural logarithm of bank Z-score, a proxy for insolvency risk that equals the return on assets plus the capital asset ratio divided by the standard deviation of asset returns. NPL is the percentage of non-performing loans over total gross loans. LAW is the rule of law index. LERNER is the Lerner index. BOONE is the Boone indicator. LERNER and BOONE are proxies for bank market power. CONC is bank concentration, measured as the fraction of the assets of the three largest banks as a share of the assets of all commercial banks in a country. ENTRY is an index that measures the legal restrictions to entry into the banking industry. RESTOWN measures the legal restrictions on bank ownership and control by non-financial firms. The sample consists of 110 developed and developing countries during the 1989– 2008 period. Industrial information comes from the UNIDO database. Country-level financial information is collected from the World Bank Statistics Database. Information on institutional variables is from The World Bank Institute's Governance Group. Regulatory variables come from the Barth et al. (2006) database. ***, and ** represent the significance at the 1% and 5% levels, respectively.

	Volatility VA (Log.)	**FD (%)**	**ZSCORE**	**NPL (%)**	**LAW**	**LERNER**	**BOONE**	**CONC**	**ENTRY**	**RESTOWN**
Volatility VA (Log.)	1.0000									
FD (%)	-0.1913***	1.0000								
Z-SCORE	-0.1191***	0.1438***	1.0000							
NPL (%)	0.1838***	-0.2791***	-0.2743***	1.0000						
LAW	-0.2271***	0.7246***	0.1083***	-0.4763***	1.0000					
LERNER	-0.0182	-0.1508***	0.0372	0.1317***	-0.1903***	1.0000				
BOONE	-0.0284**	0.0700***	0.0150	-0.0132	0.0760***	-0.0706***	1.0000			
CONC	0.0972***	-0.2354***	-0.0237**	-0.0579***	-0.1525***	0.3021***	0.0502***	1.0000		
ENTRY	-0.0168	-0.1517***	-0.0788***	0.1116***	-0.1859***	-0.0151	0.0096	0.0627***	1.0000	
RESTOWN	0.0701***	-0.1915***	0.0585***	0.1885***	-0.2174***	-0.0259**	-0.0259**	-0.0595***	0.0309***	1.0000

Table 4
BankingStability, Financial Development, and Economic Volatility

This table shows results of regressions analyzing the effect of banking stability on industrial economic volatility after controlling for financial development. Regressions are estimated using instrumental variables and OLS for cross-country data at industry-level. PANEL A presents the results using the ZSCORE as a proxy for banking stability. PANEL B presents the results using the ratio of non-performing loans-to-gross loans (NPL) proxying for (in)stability of the banking system. The dependent variable is the adjusted standard deviation of industrial value added. ISHARE is the initial share of value added for each industry. ED is the measure of external financial dependence calculated in Rajan and Zingales (1998). FD is a measure of financial development and is defined as the ratio of bank private credit from commercial banks-to-GDP. INTAN is the ratio of intangible assets-to-net fixed assets calculated in Claessens and Laeven (2003) for US data. LAW is an index measuring the rule of law of each country. The Durbin-Wu-Hausman statistic tests the null hypothesis that the use of instruments for country-level variables does not change the estimation outcome. We report IV estimates when the test is rejected at the one percent level. The instruments used are: legal origin dummy variables (English, French, German and Scandinavian) and time dummies. Standard errors are clustered by country and industry. T-statistics are between parentheses. ***, **, and * indicate significance levels of 1%, 5%, and 10%, respectively.

		PANEL A: Using ZSCORE				**PANEL B: Using NPL**			
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**
ISHARE	-0.0453***	-0.0298**	-0.0494***	-0.0456***	-0.0448***	-0.0265**	-0.0265**	-0.0330**	-0.0354***
	(-3.84)	(-2.53)	(-4.20)	(-4.08)	(-3.88)	(-2.06)	(-1.99)	(-2.53)	(-2.65)
*ED*FD*	-0.1656***		-0.1534***	-0.1004***			-0.0733***	-0.2726***	
	(-6.74)		(-6.21)	(-4.08)			(-5.89)	(-6.51)	
*BANKSTAB * ED*		-0.1358***	-0.1719***			0.0260***	0.0361***		
		(-4.60)	(-5.61)			(6.34)	(8.38)		
*BANKSTAB * ED * FD*				-0.0518***	-0.1174***			0.0066***	0.0067***
				(-9.09)	(-5.24)			(8.77)	(8.39)
*BANKSTAB * INTAN * LAW*				-0.0236***	-0.0496***			0.0897***	0.0172*
				(-3.08)	(-6.09)			(5.72)	(1.66)
Country-Industry	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Country-Period	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Industry-Period	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
R-Squared	0.0266	0.0165	0.0324	0.0563	0.0363	0.0268	0.0504	0.0626	0.0473
F-Test	17.20***	12.13***	17.25***	28.49***	18.97***	10.52***	18.04***	15.50***	15.13***
# Observations	4,620	4,856	4,520	4,481	4,481	2,964	2,786	2,786	2,786
Durbin-Wu-Hausman Test	15.78***	0.18	7.68***	8.98***	7.59***	0.66	2.09	13.17***	1.79

Table 5
Banking Stability, Bank Market Competition, and Ownership relationships

This table shows the results of regressions analyzing the effect of banking stability on industrial economic volatility by subsamples of countries around the median values of country variables. Regressions are estimated using instrumental variables and OLS for cross-country data at industry-level. PANEL A presents the results using the ZSCORE as a proxy for banking stability. PANEL B presents the estimations using the ratio of non-performing loans-to-gross loans (NPL) proxying for instability of the banking system. The dependent variable is the adjusted standard deviation of industrial value added. ISHARE is the initial share of value added for each industry. ED is the measure of external financial dependence calculated in Rajan and Zingales (1998). FD is a measure of financial development and is defined as the ratio of bank private credit from commercial banks-to-GDP. INTAN is the ratio of intangible assets-to-net fixed assets calculated in Claessens and Laeven (2003) for US data. LAW is an index measuring the rule of law of each country. LERNER is the Lerner index. BOONE is the Boone indicator. CONC is bank concentration, measured as the fraction of the assets of the three largest banks as a share of the assets of all commercial banks in a country. ENTRY is an index that measures the legal restrictions to entry into the banking industry. RESTOWN measures the legal restrictions on bank ownership and control by non-financial firms. The Durbin-Wu-Hausman statistic tests the null hypothesis that the use of instruments for country-level variables does not change the estimation outcome. We report IV estimates when the test is rejected at the one percent level. The instruments used are: legal origin dummy variables (English, French, German and Scandinavian) and time dummies. Standard errors are clustered by country and industry. T-statistics are between parentheses. ***, **, and * indicate significance levels of 1%, 5%, and 10%, respectively.

PANEL A: Using ZSCORE

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Above Median LERNER	**Below Median LERNER**	**Above Median BOONE**	**Below Median BOONE**	**Above Median CONC**	**Below Median CONC**	**Above Median ENTRY**	**Below Median ENTRY**	**Above Median RESTOWN**	**Below Median RESTOWN**
ISHARE	-0.0472***	-0.0443**	-0.0556***	-0.0323**	-0.0518***	-0.0349**	-0.0543***	-0.0257	-0.0443***	-0.0492***
	(-3.07)	(-2.56)	(-3.10)	(-2.50)	(-3.16)	(-2.40)	(-3.95)	(-1.41)	(-3.02)	(-2.75)
*FD * ED*	-0.2281***	-00.2142	0.0230	-0.2562***	-0.1947***	-0.0553***	-0.0161	-0.0557***	-0.1091	-0.1260***
	(-5.25)	(-0.82)	(0.72)	(-3.90)	(-6.11)	(-3.47)	(-0.89)	(-3.24)	(-0.59)	(-8.31)
BANKSTAB FD * ED*	-0.0482***	-0.0179	-0.0423***	-0.0451	-0.0444***	-0.0380	-0.0727***	-0.0522	-0.0409***	-0.0893***
	(-5.85)	(-0.23)	(-4.86)	(-0.63)	(-7.28)	(-1.18)	(-6.69)	(-0.61)	(-5.96)	(-3.41)
BANKSTAB INTAN * LAW*	-0.0384***	0.1514	-0.0477***	-0.0303***	-0.0250***	-0.0332**	-0.0301***	-0.2298***	-0.0786	-0.0111
	(-3.55)	(0.69)	(-4.25)	(-2.87)	(-2.62)	(-2.58)	(-3.14)	(-3.48)	(-0.41)	(-1.15)
Country-Industry	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Country-Period	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Industry-Period	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
R-Squared	0.0700	0.0213	0.0412	0.0639	0.0775	0.0314	0.0853	0.0536	0.0301	0.0819
F-Test	17.41***	5.19***	10.50***	20.53***	22.92***	9.19***	28.05***	9.30***	10.10***	23.62***
# Observations	2,331	2,150	2,224	2,257	2,259	2,222	2,815	1,666	2.435	2,046
DHW Test	29.82***	16.82***	2.89**	34.64***	11.84***	6.88***	1.75	21.82***	15.73***	33.57***

PANEL B: Using NPL

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Above Median LERNER	**Below Median LERNER**	**Above Median BOONE**	**Below Median BOONE**	**Above Median CONC**	**Below Median CONC**	**Above Median ENTRY**	**Below Median ENTRY**	**Above Median RESTOWN**	**Below Median RESTOWN**
ISHARE	-0.0332*	-0.0353*	-0.0445**	-0.0319	-0.0333*	-0.0248	-0.0468***	-0.0116	-0.0283	-0.0529***
	(-1.80)	(-1.94)	(-2.52)	(-1.58)	(-1.91)	(-1.28)	(-3.09)	(-0.49)	(-1.46)	(2.99)
*FD * ED*	-0.3621***	-0.0270	-0.2450***	-0.0318*	-0.1164***	-0.5659***	-0.1062***	-0.6383***	-0.1522***	-0.1244***
	(-5.62)	(-1.31)	(-3.97)	(-1.75)	(-7.05)	(-6.44)	(-6.71)	(-8.79)	(-2.61)	(-7.46)
BANKSTAB FD * ED*	0.0071***	0.0005	0.0078***	0.0132***	0.0094***	0.0075	0.0061***	0.0070	0.0143**	0.0068***
	(8.78)	(0.15)	(6.36)	(3.50)	(4.78)	(1.00)	(9.28)	(1.31)	(2.40)	(3.43)
BANKSTAB INTAN * LAW*	0.0903**	-0.0017	0.1327***	-0.0022	0.0142	-0.0002	0.0336***	0.1167***	-0.0032	0.0440***
	(3.92)	(-0.70)	(6.69)	(-1.06)	(1.13)	(-0.11)	(2.79)	(4.33)	(-1.42)	(3.07)
Country-Industry	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Country-Period	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Industry-Period	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
R-Squared	0.1015	0.0183	0.0885	0.0246	0.0590	0.1268	0.0713	0.1114	0.0378	0.0649
F-Test	14.15***	3.19***	12.99***	4.02***	12.20***	18.97***	21.44***	15.48***	7.26***	22.75***
# Observations	1,412	1,374	1,387	1,399	1,383	1,403	1,706	1,080	1,347	1,439
DHW Test	7.49***	3.24**	34.84***	33.36***	1.65	18.82***	2.60*	31.33***	38.49***	12.04***

Table 6. Systemic Banking Crises and Economic Volatility

This table shows the results of regressions analyzing the effect of banking stability on industrial economic volatility using a CRISIS dummy variable as an alternative proxy for banking stability. In Panel A we use the CRISIS dummy variable that takesvalue 1 in the period in which the country has experienced a banking crisis and the following periods. Otherwise, it takes value 0. In Panel B we use the CRISIS dummy variable that takesvalue1 in the period in which the country has experienced a banking crisis, and 0 otherwise. Regressions are estimated using OLS or instrumental variables for cross-country data at industry-level. The dependent variable is the adjusted standard deviation of industrial value added. ISHARE is the initial share of value added for each industry. ED is the measure of external financial dependence calculated in Rajan and Zingales (1998). FD is a measure of financial development and is defined as the ratio of bank private credit from commercial banks-to-GDP. INTAN is the ratio of intangible assets-to-net fixed assets calculated in Claessens and Laeven (2003) for US data. LAW is the country's rule of law. The Durbin-Wu-Hausman statistic tests the null hypothesis that the use of instruments for country-level variables does not change the estimation outcome. We report IV estimates when the test is rejected at the one percent level. The instruments used are: legal origin dummy variables and time dummies.Country-industry, country-period, and industry-period dummy variables are included but are not reported. T-statistics are between parentheses. ***, **, and * indicate significance levels of 1%, 5%, and 10%, respectively.

	PANEL A: Crisis & Post-Crisis Periods				**PANEL B: Crisis Periods**			
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
ISHARE	-0.0442***	-0.0454***	-0.0443***	-0.0458***	-0.0462***	-0.0460***	-0.0450***	-0.0461***
	(-3.83)	(-3.87)	(-3.83)	(-3.91)	(-3.94)	(-3.93)	(-3.83)	(-3.93)
*ED * FD*	-0.1815***	-0.2703***	-0.2654***	-0.2879***	-0.1744***	-0.2554***	-0.1961***	-0.2605***
	(-7.53)	(-6.41)	(-9.00)	(-6.66)	(-7.21)	(-5.74)	(-7.06)	(-5.79)
*CRISIS * ED*	1.2737***				0.8421**			
	(5.88)				(2.22)			
*CRISIS * ED * FD*		0.0295***	0.1657***			0.0480	0.1116*	
		(3.12)	(5.70)			(0.77)	(1.92)	
*CRISIS * INTAN * LAW*		0.1762**		0.2395***		0.3869*		0.4799**
		(2.51)		(3.42)		(1.94)		(2.53)
Country-Industry	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Country-Period	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Industry-Period	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
R-Squared	0.0353	0.0330	0.0346	0.0306	0.0288	0.0293	0.0274	0.0292
F-Test	20.79***	15.89***	19.96***	16.63***	16.19***	13.50***	15.22***	15.43***
# Observations	4,612	4,573	4,612	4,573	4,573	4,573	4,573	4,573
Durbin-Wu-Hausman Test	12.46***	12.29***	15.65***	12.37***	8.72***	6.58***	9.14***	10.18***

Table 7.Banking Stability, Financial Development, and Economic Volatility: Real & Monetary Shocks

This table shows the effect of banking stability on economic volatility following the approach suggested in Beck et al. (2006). Regressions are estimated using OLS or instrumental variables for cross-country data at industry-level. The dependent variable is the adjusted standard deviation of industrial value added. ISHARE is the initial share of value added for each industry. FD is a measure of financial development and is defined as the ratio of private credit from commercial banks-to-GDP. SD_TOT and SD_INF are the adjusted standard deviation of terms of trade and the adjusted standard deviation of inflation, respectively. INTAN is the ratio of intangible assets-to-net fixed assets calculated in Claessens and Laeven (2003) for US data. ED is the measure of external financial dependence calculated in Rajan and Zingales (1998). LAW is the measure of institutional quality. The Durbin-Wu-Hausman statistic tests the null hypothesis that the use of instruments for country-level variables does not change the estimation outcome. We report IV estimates when the test is rejected at the one percent level. The instruments used are: legal origin dummy variables (English, French, German and Scandinavian) and time dummies.Country-industry, country-period, and industry-period dummy variables are included but are not reported. T-statistics are between parentheses. *** and **, indicate significance levels of 1%, and 5%, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
ISHARE	-0.0272*	-0.0339**	-0.0603***	-0.0588***	-0.0427**	-0.0518***	-0.0320*
	(-1.75)	(-2.03)	(-3.19)	(-3.12)	(-2.48)	(-3.09)	(-1.92)
FD	-0.4140***						
	(-4.15)						
SD_TOT	0.2914***						
	(8.23)						
SD_INF	-0.0465						
	(-0.42)						
*FD * ED*			-0.1483***	-0.1425***	-0.0923***	-0.0866***	
			(-6.75)	(-6.28)	(-4.67)	(-4.20)	
*SD_TOT * FD*	-0.2362***	-0.0009**		-0.0674*		0.0001	
	(-8.33)	(-2.31)		(-1.90)		(1.27)	
*SD_INF * FD*	0.1789***	0.0054**	0.0248*	0.0286**			
	(3.53)	(2.24)	(1.74)	(2.01)			
*SD_TOT * ED * FD*							-0.0019
							(-1.64)
*SD_INF * ED * FD*					0.0156***	0.0173***	0.0163**
					(2.67)	(2.86)	(2.34)
*SD_INF * INTAN * LAW*					0.0014*	0.0282**	0.0480***
					(1.75)	(1.98)	(3.30)
Country-Industry	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Country-Period	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Industry-Period	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
R-Squared	0.1077	0.0340	0.0916	0.0937	0.0636	0.0617	0.0401
F-Test	22.93***	9.46***	24.55***	21.39***	15.95***	14.78***	9.58***
# Observations	1,653	1,653	1,604	1,604	1,552	1,552	1,653
Durbin-Wu-Hausman Test	7.98***	2.60*	10.67***	10.67***	7.50***	7.21***	8.87***