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Guy Liu and Ali Mirzaei

**Industrial Growth: Does Bank
Competition, Concentration and Stability
Constraint Matter? Evidence from
developed and emerging economies**

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Industrial Growth: does Bank Competition, Concentration and Stability Constraint Matter? – Evidence from developed and emerging economies

Guy Liu^{a,b} Ali Mirzaei^{a,1}

a: Department of Economics and Finance, Brunel University, Uxbridge, Middlesex, UK, UB8 3PH

b: Department of Industrial Economics, School of Management, Fudan University

Abstract

The paper assesses a controversial issue about the role of bank competition in creating spillover effects on growth of non-banking industries in terms of output and new business creation, using a sample of more than 6,000 banks and 23 industries across 48 economies. Three arguments arise from our evidence. First, we distinguish a state of competition between cooperative and non-cooperative interaction, and identify that non-cooperative bank competition promotes growth robustly, but other measurements of competition fail, suggesting that the state of competition matters for growth. Secondly, when banks compete non-cooperatively for large, the high concentration of leading banks is a result of the competitive process of efficient market selection, rather than market power that reduces competition. Thirdly, bank financial stability constrains lending which affects growth, and the constraint appears harder on growth in developed economies in contrast to emerging markets where the constraint is soft or decoupled from growth.

Key words: Bank competition, Market concentration, Financial stability, Industrial growth

JEL: D4, G2, G3, L1, L2, O4

¹ The Contact detail of Authors: Ali Mirzaei at dr.ali.mirzaei@gmail.com, and Guy Liu at guy.liu@brunel.ac.uk

1 Introduction

The contribution of financial market development to economic growth has been well studied and recognised by the literature.² This development helps to mobilize financial resources of savings, improve capital allocation and corporate governance, as well as reducing the costs of access to both investment opportunities and funds to finance business (Jensen and Meckling, 1976 and Myers and Majluf, 1984). In contrast, for banking systems as a part of the financial market, the former has attracted a good attention of research but with controversial views about the impact of bank competition development on economic growth. Particularly, the literature is quite divided on the argument for the role of large or concentrated large banks in promoting economic and industrial growth.

Rajan and Zingales (1998) regard a banking system as a specific mechanism to transmit the impact of the financial market development to growth. In this regards, banks are expected to spill over their effects of competition development on the business behaviour and performance of nonfinancial industries. This argument is supported and is evident in studies by the likes of Vives (2001), Claessens and Laeven, (2005), Cetorelli and Strahan (2006), Maudos and Fernandez de Guevara (2006), and Bertrand et al (2007).

Cestone and White (2003) developed a theoretical view in arguing that more competition in a financial market can provide bank lenders with more incentives in financing industries, particularly, new entrants to the business, and hence to promote growth. This argument is consistent with evidence identified by Cetorelli and Gambera (2001) from their cross-country study of bank concentration as a measure of market power in a banking sector that has an adverse effect on economic growth.

Competition can drive banks to reduce their lending costs to borrowers and so increase demand for bank funds to support business and growth. This view has been supported by evidence identified by Angelini et al. (1998) and D'Auria et al. (1999) in their study of Italian banks for their lending costs to Italian corporate borrowers, by Berlin and Mester (1999) that found a negative association between competition and the cost of finance, and by Beck et al (2004) for more concentration or market power in banking sectors that increases financial obstacles to smaller firms in accessing finance for their growth.

² For instance, see Schumpeter (1911); Gurley and Shaw (1955, 1967); Goldsmith(1969); McKinnon (1973; Shaw (1973); King and Levine (1993a and b); Levine and Zervos (1998); Rajan and Zingales (1998); Demirguc-Kunt and Maksimovic (1998); Guiso et al (2004); Levine (2005); Loayza and Rancière (2006); and others as well.

Competition promotes growth. Cameron (1967) argues competition in the banking sector affects competition in non-banking industries. There is evidence in support of this view. Cetorelli (2003) found that less competition in the banking sector is associated with less new entrants in non-financial industries. On the basis of a panel of manufacturing industries in 29 OECD countries, Cetorelli (2004) also finds evidence that the process of enhanced competition in EU banking markets is associated with lower average firm size, implying more entrants in other industries with increasing competition in the bank sector. Cetorelli and Strahan (2006) analyse the impact of bank concentration on small US firms, finding that entrants face less difficulty in gaining access to credit if they operate in a less concentrated market of banks.

However, contrary to the above, it is argued that more market power with less competition can help relax external financing constraints on non-financial firms, because banks with more market power can gain more incentives to invest in lending relationship with borrowers, so enabling the banks to provide their clients with more credits available for business development, and hence promoting economic growth (Mayer, 1988 and 1990; Peterson and Rajan 1995; Dell'Araccia and Marquez, 2004). Boot (2000), for instance, argues that in an uncompetitive banking system, firms have greater access to credit in the long-term, although they may run the risk of paying more interest.

The effect of Bank investment on the lending relationship will create favours for external-finance-depending firms in gaining a better access to bank finance in support of their business and growth, argued and evidenced by Boot (2000) and Boot and Thakor (2000). Although in the run long, the cost of borrowing may raise, this disadvantage can be offset by faster business growth facilitated by the better access to external finance, which enables the firms to respond to business development opportunities more effectively. The importance of a good lending relationship is to mitigate the problem of asymmetric information between banks and their clients in loan provision, which helps banks to be more efficient in identifying and supporting the need of the firms for growing their business (Boot, 2000). This argument is put forward by Petersen and Rajan (1994), Elsas and Kanhen(1998), Harhoff and Karting (1998) and Cole (1998). Degryse & Van Cayseele (2000) and Chakrabortt & Hu (2006) further added their evidence in arguing that a good lending relationship helps reduce the amount of assets required as securities for loan provision.

It is observed that external-finance-depending industries experienced slow growth in a situation where bank competition is high, which creates fewer incentives for banks in investing in the lending relationship (Rajan 1992; Petersen and Rajan 1995, and Chen, 2007). Peterson and Rajan (1995), for example, showed that countries with a few but more powerful banks are associated with the appearance of new firms, suggesting that the more concentration within a bank sector, the more this reduces the financial constraints on firms.

Cetorelli and Gamberra (2001) assess the impact of banking market structure on growth. Using a sample of 41 countries and 36 sectors over the period 1980-90, they find that the access of external-finance-dependent young firms to credits is facilitated more by a more concentrated banking system. Similarly, Bonaccorsi di Patti and Dell’Ariccia (2004) use this approach and find that there is a positive relationship between banking system concentration and firm creation in industries.

Furthermore, in considering the argument of Carbo et al (2009) that market structure is not a good indication of bank competition, the non-structural approach is employed to measure competition for the study of the impact of bank competition on growth. The views from this approach are also contrary to those above. For instance, Claessens and Laeven (2005) examine the influence of banking competition on economic growth, using Panzar and Rosse *H*-statistic as a non-structural or behavioral approach to indicate market competition, and they find that sectors heavily dependent on bank financing grow faster in countries where there is fierce bank competition. On the basis of the similar approach, Maudos and Fernandez de Guevara (2006) used the *H*-statistics, Lerner index and concentration ratio as proxies to indicate the intensity of competition for a sample of data from 53 sectors in 21 countries over the period of 1993-2003, and they find opposite evidence that the exercise of market power enhances economic growth, supporting the lending relationship argument with the implication that bank competition may have a negative impact on the availability of finance for industries.

Apparently, the opposite arguments made by these two widely-cited studies on bank competition effects on growth represent the on-going debate in the current literature to the question – does bank competition promote growth for its economy and industries?

For studies related to bank competition, one commonality is that bank competition is understood more as a state of equilibrium rather than a dynamic process of interaction among firms. Particularly, the distinction between cooperative and non-cooperative behavior in

competition is hardly noticed. Cooperation means that all firms take same action or strategy to competitively interact with each other for either winning together or losing together. A good example of this cooperative competition is the perfect market competition – all firms raise the price in response to a cost rise. In contrast, there is no guarantee for all of firms to behave the same as expected in the perfect market competition if the firms are involved in non-cooperative competition. Non-cooperation means that firms take their own action or strategy to competitively interact with each other in the best interests of their own, and as a result, some win and some lose. The latter regards competition more as a dynamic process and it is often seen in imperfect market competition.

In this light, if competition is a rival or non-cooperative process, large banks can be developed through the process of a competitively rival selection – a firm grows at the expense of the growth of its rivals. This means that efficient banks can grow by taking more market share from its inefficient rival banks, and in the long run the inefficient banks will shrink or will exit the market, resulting in the market inevitably being more concentrated. Therefore, a high concentration does not mean less competition if large banks are involved in the process of rival competition. Under the rival pressure, large banks can be driven more aggressively in providing industries with a better access to finance or with more investment in improving banks' lending relationship in support of industrial growth. As such we would expect that if banks compete non-cooperatively through being large, a high concentration can be inevitable in an efficient market with a very selective process of rival competition.

Clearly, the argument we put forward here is particularly meaningful for the current debate on whether banks that should be bigger or not. Our argument leads us to re-consider the evidence in terms of its support for the argument that bank competition leads to growth because bank concentration has been widely perceived in the literature as an indication of market power that can reduce competition.

In order to verify the argument proposed by this paper, which is the opposite to the prevalent view on concentrated market structure reducing competition, a key challenge is to find out whether banks are rivalry competitive. Particularly, how we can identify the rival state of competition is a pioneering attempt in empirical research. Without the rivalry, the concentration can imply a market environment in favor of business collusion and so weaken competition.

To empirically identify rival competition in a banking sector and its competitive impact jointly with the concentration effect on growth, which is the distinctive attempt of this paper from existing studies, we take two stages for our research. First, we follow the concept of “efficiency competition” developed by Hay and Liu (1997) to set a simple model to identify rival competition in the context of bank business. The idea of the model is simple. The relationship between the market share of a bank and its cost efficiency can indicate how aggressive banks are in using their own cost advantage to compete in the market against its rivals. The strength of the relationship reflects the rival behavior of competition and its intensity. On the basis of this idea, a sample data of about 6,000 banks from 48 countries over the period 2001 to 2010 is estimated to see if rival competition exists in the banking business across countries.

Having assessed the competition of an economy, in stage two then on the basis of both the estimation method of financial development impact on growth developed by Rajan and Zingales (1998) and another by Cetorelli and Gambera (2001) that augmented the former method for their study of the industrial growth impact of bank competition, rival competition and concentration are jointly examined for their respective impact on the growth of 23 financially-dependent industries across 48 emerging and advanced economies.

One piece of evidence from our cross-industry and country estimation is that industrial growth is high within economies where rival competition is stronger. In the presence of rival competition within a bank sector, growth is also high with concentration within developed economies. The evidence is consistent with our claim that bank concentration has a large effect on growth via its competitive process. Our estimation over the time span between 2001 and 2007 implies that in the new century, bank competition becomes more non-cooperative and rivalry, which creates the spillover effects of competition on growth. In contrast to our successful estimation of the growth impact of bank competition using the new efficiency competition model to measure competition, the H-statistics³ and Lerner Index as an alternative measure of competition fails in showing its impact on growth in our sample data,

³ The H-statistic is developed for testing the statistical link between the sales price (sales revenues) and the input costs of firms in order to identify how a market is close to the state of perfect competition. Perfect competition is a good example of cooperative competition because in response to a cost rise every firm has to raise its price to match the costs.

suggesting that the test of bank competition and the growth relationship is sensitive to the state or measure of competition.

Bank competition cannot impact growth without banking stability. The financial stability of a bank constrains the capability of lending to industries, which affects growth. For instance, the higher the amount of non-performing loans in assets, the more the provision of funds is needed to put aside from the banking business in order to prevent a risk of potential defaults. The required provision restricts the lending ability of the bank, which in turn affects growth. This argument is evident by our study that the effect of the financial stability constraint on growth is robust in our estimation and is another distinctive finding of the paper. The improvement of financial stability reduces the constraint on lending and so promotes growth. The empirical support to this expectation varies with regions. In developed economies, the constraint is significantly harder on growth; and in the emerging economies, it is soft or decoupled from the growth. The contrast of the constraint inspires us with a new view about why the 2008 bank crisis hit growth more severely in the West than in the emerging economies.

By taking into account the constraint of the financial stability on bank lending in our estimation, we show that a stronger non-cooperative competition and its competitively driven concentrated banking sector promotes industries not only to grow faster but also to support more new entrants to business and so creates jobs. The policy implication of our findings is clear: competitively-driven large banks and so high concentration promotes growth and job creation for an economy.

The remainder of this article is organized as follows. In the next section, we discuss our research method on the estimation of both rival competition and its effect on growth. In Section 3 we describe data employed for the estimation of the rival competition effect on growth of the industries. The main empirical results regarding the spillover effect of banking competition and stability constraint on growth are reported in Section 4. Section 5 discusses robustness tests, and Section 6 concludes.

2 Methodology

To explore the spillover effect of bank rival competition on other industries empirically, there are two issues. One is about how to identify rival competition in the bank market, and another is related to the statistical verification of the relationship between bank competition in one sector and the growth of industries in another sector.

Measurement of bank competition

For bank competition, a market structure has commonly been taken by existing studies to indicate the intensity of competition in the sector. However, the study of industrial economics has shown that the market structure is not an effective indicator of competition. For instance, a contestable market is perfectly competitive even when there is only one firm operating in the market. As a result, H-statistics developed by Panzar and Rosses as a non-structural or a behavioural approach becomes prevalent in a study of bank competition. With the expectation that prices or sales will respond to a rise in input costs positively if the market is perfectly competitive, Panzar and Rosses devise a statistical link between the output sales and the input costs as an indicator to identify how competition is close to the state of the perfect competition. This is true if firms are cooperatively competitive. Otherwise, the H-statistic can fail or lose its power in capturing competition if firms are non-cooperative or in rivalry with each other. There is no guarantee that a firm will raise its price, and so sales, in response to the cost rise when it has different cost efficiency and is in rival with others. To take this rival problem into account in measuring competition, our paper takes an alternative approach that can be more effective to identify firms involved in the non-cooperative competition.

One outcome of non-cooperative competition is that a firm increases its output at the expense of the rivals. Suppose the rise in the firm's output is due to its high efficiency that enables it to lower its price, then the change in output relative to rival firms can indicate how aggressive the efficient firm is in taking advantage of its cost efficiency to compete in the market - a competitively rival behaviour. This is a basic idea of an efficiency competition model developed by Hay & Liu (1997). With their rival model, they measure competition of 21 UK manufacturing industries respectively and identified consistently and significantly the negative relationship between the market share of a firm and its cost efficiency relative to the rivals. We call this non-cooperative or rival "efficiency competition". With this idea that a firm with high efficiency grows more than those with less efficiency if market is competitively selective, we employ a simplified version of Hay & Liu's model to estimate competition within the context of the banking business, which is as follows:

$$MS_{it} = \alpha + \beta \frac{c_{it}}{\bar{c}_t} + \gamma P_{it} + \varepsilon_{it} \quad (1)$$

where the subscripts i and t denote bank i at time t in each country. MS_{it} is the market share of a bank i at year t , c_{it} is the unit overhead cost (total non-interest expenses) of total assets of a bank at year t , \bar{c}_t is the average overhead costs per unit of the total assets of the bank sector at year t . P_{it} is an interest rate spread, implying a price of bank assets employed for banking business. In a competitive market, we expect a negative coefficient (β). This is because, in any non-cooperative competition, firms with higher costs relative to the market average costs will grow slowly and then lose their market share. With this expectation, empirically, we can estimate β in model (1) using bank-level data for each economy. Once we identify β for an economy or country, then we can rank them in terms of their β size: the stronger link has a big size which indicates more rival competition in the banking sector. Our empirical estimation of model (1) for bank competition β in an economy is discussed in detail by another study of the authors (Liu & Mirzaei, 2012).⁴ We employ the dynamic GMM panel method to estimate β for each economy, presented in Table 1. Then β as the measure of rival competition is applied to our cross-country-industry estimation of the spillover effect of bank competition on the growth of other industries.

⁴ This paper is available upon request.

Table 1: Efficiency Competition: emerging vs. advanced economies

Emerging economies		Advanced economies	
Country	Efficiency competition $ \beta $	Country	Efficiency competition $ \beta $
Argentina	2.7%	Australia	4.5%
Brazil	0.3%	Austria	1.9%
Chile	6.6%	Belgium	6.0%
China	1.7%	Canada	0.4%
Colombia	1.7%	Denmark	2.0%
Czech Rep.	1.6%	Finland	11.3%
Egypt	1.3%	France	1.8%
Estonia	1.5%	Germany	3.3%
Hungary	1.2%	Greece	2.3%
India	1.1%	Iceland	10.9%
Indonesia	1.8%	Ireland	1.8%
Malaysia	1.5%	Israel	2.5%
Mexico	1.5%	Italy	1.9%
Morocco	0.4%	Japan	4.9%
Peru	1.8%	Korea	7.4%
Philippines	4.5%	Luxembourg	12.7%
Poland	6.0%	Netherlands	14.0%
Russia	0.6%	New Zealand	15.8%
Slovak Rep.	1.8%	Norway	2.7%
Slovenia	4.9%	Portugal	1.4%
South Africa	19.7%	Spain	1.8%
Thailand	1.5%	Sweden	3.3%
Turkey	2.1%	Switzerland	3.2%
		UK	4.7%
		US	1.2%
Average	2.95%	Average	4.95%

Note: This table reports the results from the regression model estimation Eq. (1): $MS_{it} = \alpha + \beta \frac{c_{it}}{c_t} + \gamma P_{it} + \varepsilon_{it}$. The level of efficiency competition is equal to the absolute value of β . The higher value of β indicates a more competitive market.

A model to estimate the relationship of bank competition with other industries

Regarding the second issue on how to estimate the spillover effect of bank competition on the non-financial industry in our paper, we augment a model proposed by Rajan and Zingales (1998), and further developed by Cetorelli and Gamberra (2001), Claessens and Laeven (2005) and Cetorelli and Strahan (2006), which addresses the effect of banking performance on industry growth. Rajan and Zingales (1998) focus on analysing the effect of financial development on growth, and test whether the sectors which rely more on external finance yield higher growth in economies with a higher level of financial development. In order to avoid the problem of identification that arises in the cross-country regressions which are observed in the literature on economic growth, Rajan and Zingales introduced an innovative specification by introducing the interaction between an industry characteristic (external financial dependence) and a country characteristic (financial development). As noted by Maudos and Fernandez de Guevara (2006), this test allows us to examine whether ex-ante financial development facilitates firms' access to finance, and thus intensifies ex-post growth in the heavily financial-dependent sectors.

In line with the Rajan and Zingales's development, we introduce a new variable to integrate the financial dependence of the industry and the degree of competition on an economy to evaluate the bank spillover effect on the growth of other industries. This allows us to examine whether the sectors with more demand for external finance can grow faster in the economy where more competition appears in its banking system. We examine competition jointly with the concentration for their respective effects on the growth of others in order to see the role of concentrated large banks in affecting other industries under rival competition. Thus, our augmented model for estimation is as follows:

$$\begin{aligned}
Growth_{i,c} = & Constant + \beta_1 Sector\ Dummies_i + \beta_2 Country\ Dummies_c \\
& + \beta_3 Share\ in\ value\ added_{i,c} \\
& + \beta_4 External\ Dependence_i \times Bank\ Development_c \\
& + \beta_5 External\ Dependence_i \times Bank\ Competition_c \\
& + \beta_6 External\ Dependence_i \times Bank\ Stability_c + \varepsilon_{i,c} \quad (2)
\end{aligned}$$

where subscripts i and c refer to industry i in country c , respectively. *Growth* is the average (compounded) annual growth rate of value added of industry i in country c . Our measure of growth is similar to one used by Rajan and Zingales (1998) and Cetorelli and Gambera (2001). *Banking Development* is an indicator of the development of the banking system in country c such as credit provided to the private sector, *Banking Competition* is a measure of the degree of banking competition in country c (i.e. an efficiency competition index or H -statistic or Lerner index), and *Banking Stability* picks up the overall constraint of bank financial stability on bank's lending capability (measured by the Z -index or non-performing loans) in country c . The higher Z -index score indicates the higher stability that lowers the constraint on the lending and so promotes growth.

In model (2), *External Dependence* is the external-financing dependence of an industry, taken from Rajan and Zingales (1998), at the two digit level by the classification of ISIC Rev.2. Rajan and Zingales calculated sector dependence for U.S. manufacturing industries in the 1980s, using data of publicly traded, relatively large firms in Standard and Poor's Compustat database. From a firm's perspective, a firm's dependence on external finance is defined as capital expenditures minus cash flow from operations divided by capital expenditures. Rajan and Zingales extend the firm measurement to the industry level of external financing ratio in the U.S with the assumption that the US ratio constitutes a global benchmark of each sector's reliance on external financing. The point is that if bank

performance has any impact on manufacturing firm or industry growth, this impact should be prominent in those that heavily depend on external finance.

In model (2), to consider the convergent effect of an industry on its output growth, we also introduce a share variable that is the initial share of an industry output in the total industrial output of an economy, and output is indicated by value added. With the convergent effect, we expect β_3 to be negative in the estimation of (2). Guiso et al. (2004) argue that the inclusion of the initial share in total value added avoids the bias derived from the possible correlation between financial development and sector specialisation. The argument is that financial development can affect both the growth of a sector and the pattern of specialisation, so it incentivises the less financially developed countries to specialise in sectors that are less dependent on external finance. Moreover, by including the share of total manufacturing value added, we predict sectors, which have grown considerably in their life cycle in the past, that are unlikely to continue to grow at a high rate in the future (see also Rajan and Zingales, 1998; Cetorelli and Gambera, 2001; and Cetorelli, 2004).

The fixed effects (*Sector Dummies* and *Country Dummies*) in model (2) control any unobserved industry- or country-specific heterogeneity, and finally ε is the error term with a normal distribution. Model (2) is estimated by cross-sectional regressions since the nature of the data is cross-industries and countries over one time span of the sample period.

Our spillover effect of bank rival competition is estimated by controlling the bank stability impact, which is a distinction from the previous model that estimates the financial development impact on growth without the stability concern. With this regard, our model can differentiate between these two effects respectively. Bank stability in model (2) is calculated on the basis of the idea of the Z-score developed by Roy (1952), further revised by De Nicolo (2000), and applied by Levy Yeyati and Micco (2007) and Turk Ariss (2010) for the evaluation of bank solvency. Our calculation of the Z-score variable is to deflate the gross return to assets by σ that denotes the standard deviation of profit returns to total assets, which is defined as [(equity capital + profits)/total assets reported by the bank]/ σ . The standard deviation σ is calculated on the basis of the three-year average of the deviation of a bank from the market average for the profit returns to the assets. This window of three years enables us to capture the volatility of profit returns without the significant loss of observations in estimation. We take the average of the Z-score of all individual banks to indicate the bank stability of an economy.

Furthermore, to estimate the spillover effect of bank rival competition on the market structure of other industries, we set up another model that replaces the output growth variable with the average firm size variable as follows:

$$\begin{aligned}
 \text{Average Firm Size}_{i,c} &= \text{Constant} + \beta_1 \text{Sector Dummies}_i + \beta_2 \text{Country Dummies}_c \\
 &+ \beta_3 \text{Share in value added}_{i,c} \\
 &+ \beta_4 \text{External Dependence}_i \times \text{Bank Development}_c \\
 &+ \beta_5 \text{External Dependence}_i \times \text{Bank Competition}_c \\
 &+ \beta_6 \text{External Dependence}_i \times \text{Bank Stability}_c + \varepsilon_{i,c} \quad (3)
 \end{aligned}$$

In (3), the average firm size is calculated either as the ratio of value added to the number of firms in sector i of country c , or as the ratio of total employment and the number of firms in sector i of country c . We take the natural logarithm of these variables. Our measures of average firm size are similar to those used by Cetorelli (2004). We also replace the average firm size with the growth of a number of firms for the robust test of model (3) in Section 5.2.

Tabl 2: Descriptive and definition of variables

Variable	Definition and source
Dependent variables	
Industry growth	Average (compounded) annual growth rate of value added in a particular sector in each country over 1993-2007. Source: UNIDO database, and own calculation.
Industry market structure	Average natural logarithm of ratio either value added or total employment and total number of establishments over 1993-2007. Source: UNIDO database, and own calculation.
Explanatory variables	
Share in value added	The value added of each sector as a percentage of the total value added of an economy at the initial year (1993). Source: UNIDO database, and own calculation.
Financial dependence	External financial dependence of U.S. firms by ISIC sector over the period 1980 to 1989. This is an industry-level median of the ratio of capital expenditures minus cash flow over capital expenditures. Cash flow is defined as the sum of funds from operations, decreases in inventories, decreases in receivables, and increases in payables. Capital expenditures include net acquisitions of fixed assets. Source: Rajan and Zingales (1998).
<i>Financial development variables</i>	
Bank development	Credit provided to private sectors as a fraction of GDP. Source: World Bank-WDI.
<i>Competitiveness indicators</i>	
5-firm concentration	A country-level indicator of bank concentration, measured by total of the 5 largest banks' share of assets in total assets of all banks in a country as concentration ratio Index. Source: BankScope and own calculation.
Efficiency competition	A degree of bank-sector competition measured by the responsiveness of growth of bank market share to change of bank cost efficiency. Source: BankScope and own estimation on the basis of Hay and Liu (1997).
<i>Banking stability</i>	
Z-score	A measure of bank soundness calculated as return on assets plus capital ratio divided by volatility of return on assets. Source: BankScope and own calculation.
<i>Regulatory variables</i>	
Property rights	Measure of property rights, and ranges from 2 to 9. A higher score denotes greater protection of property. Source: Heritage Foundation.
<i>Alternative variables used for robustness</i>	
HHI index	A country-level indicator of bank concentration, measured by the Herfindahl-Hirschman Index of total assets, which is defined as the sum of the square of the market shares of all the banks. Source: BankScope and own calculation.
H-statistics	A country-level indicator of bank competition based on model proposed by Panzar and Rosse. Specifically, we calculate the H-statistics as the sum of the elasticities of revenue with respect to input prices. Higher values indicating more competition in the banking sector. Source: own estimation using BankScope data.
Lerner Index	An indicator of bank competition, calculated as the mark-up of price over marginal costs, with higher values indicating less competition in the banking sector. Source: BankScope and own calculation.
Non-performing loans	The ratio of non-performing loans to gross loans. Source: BankScope.
Bank credit	Credit provided by banking sector as a fraction of GDP. Source: World Bank-WDI.
Market capitalization	Stock market capitalization to GDP. Source: World Bank-WDI.
Market activity	Stock market turnover ratio calculated as the total value of shares traded during the period divided by the average market capitalization for the period, as an indicator of market activity. Source: World Bank-WDI.
Banking freedom	An indicator that provides an overall measure of openness of the banking sector and the extent to which banks are free to operate their businesses. It ranges from 1 to 9. Higher values signify more freedom. Source: Heritage Foundation.
Bank activity restriction	A measure of a bank's ability to engage in activities other than banking (including securities, insurance, and real estate). The indicator potentially ranges from 0 to 4, where a higher score indicates more restrictions on banks to engage in such activities. Barth et al. (2001).

Note: This table describes the variables collected for our study. The first column gives the name of variable as we use it; the second column describes and provides the source from which it was collected.

Table 2 describes variables used in our empirical analysis of model (2) and (3) together with their data sources.

3 Data

To estimate the spillover effect of bank competition, we will utilise a wide range of data across the banking sector and manufacturing industry. This study employ data from three major sources: *World Development Indicators* (published by the World Bank) for variables related to the financial development of a country, such as the private credit/GDP ratio, stock market capitalisation/GDP, and stock market turnover ratio; *the UNIDO Database* (United Nations Database on Industrial Statistics) for variables related to the nonfinancial industrial development of an economy, such as value added as the output measurement of an industry within an economy, the number of firms operating in an industry, total employment of an industry, and fixed capital formation etc. The UNIDO data provides these variables at an industry level for 23 nonfinancial sectors (the classification of ISIC Rev.3) respectively within an economy over the period 1993-2007 (Industry data are usually released with a several-year lag and the last year of available industry data at the time of writing this paper was 2007). The third source of our data is from *BankScope* which provides us with bank-level data to allow us to construct a variable that captures the intensity of bank competition in an economy over the period 2001-2010. The estimation of bank competition is provided by the authors from another study (Liu and Mirzaei, 2012) that employed the bank-level data of some 6,000 banks across 48 countries to measure competition according to different theories of competition assessment: market-structure-based approach, such as Learner Index, HHI (Herfindahl Index), the concentration ratio of the leading firms, and the behaviour-based approach, such as the H-statistic and the efficiency competition. This study takes the estimated results from the efficiency competition approach as our central measure of overall bank competition at an economy for the sample period between 2001 and 2010. Other competitiveness measures will be also used as alternatives for our robust tests. Table A1 in Appendix shows number of banks, market structure, competition, and stability of banking system of countries under study.

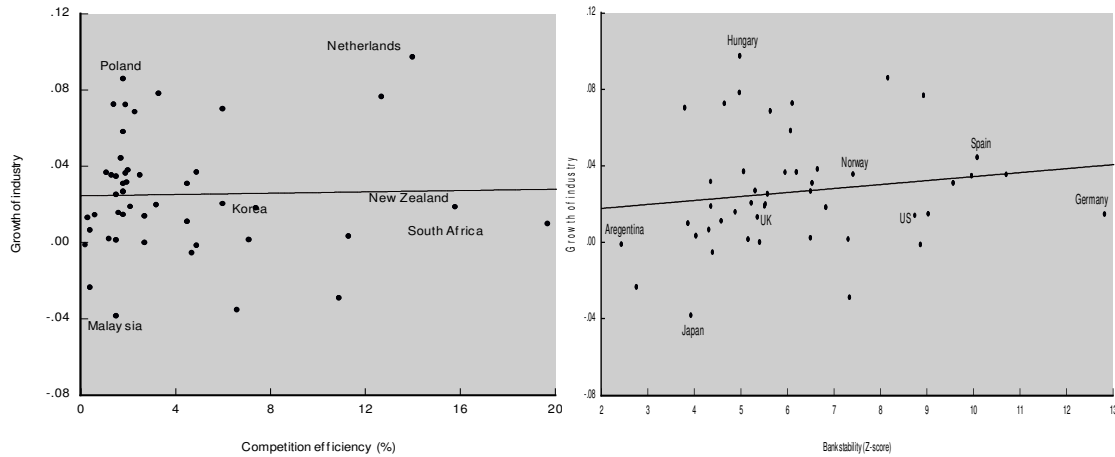
The study also takes supplementary information from Barth et al. (2001), Demirguc-Kunt et al. (2004) and the Heritage Foundation database for variables related to bank regulation and institutional arrangement, and from Rajan and Zingales (1998) for the financial dependence of an industry.

The combination of data from these three major sources and other supplementary information creates a new dataset in support of our study. We take the period 2001-2007 as a single time span to construct our variables. For instance, the growth of an industry within a particular country is defined as the overall change of its valued added in real terms from 2001 to 2007. The intensity of bank competition within a country is estimated against the same time span of the similar period. The homogeneity of the time span across different data enables us to construct cross-sectional data across 23 nonfinancial sectors and 48 countries, which gives 1,104 observations for empirical estimation. Our approach to constructing the data has been made in line with the study of the financial development impact on industry growth performance, see Cetorelli and Gambera (2001), Cetorelli (2004) and Claessens and Laeven (2005).

With our new created dataset, we plot the intensity of bank competition of each country against its industry growth of different sectors, and also against the average size of the firms in each of 23 nonfinancial sectors. These two plots enable us to glance at any empirical pattern of our data in relation to the proposed relationship between bank competition and its spillover effects on the nonfinancial sectors of an economy. As can be seen in Figure 1 and 2, the pattern showing the relationship is clear. Furthermore, we also plot the bank stability measured by z-score against industry growth and against the average firm size in order to perceive the importance of the bank stability effect that needs to be controlled in the estimation.

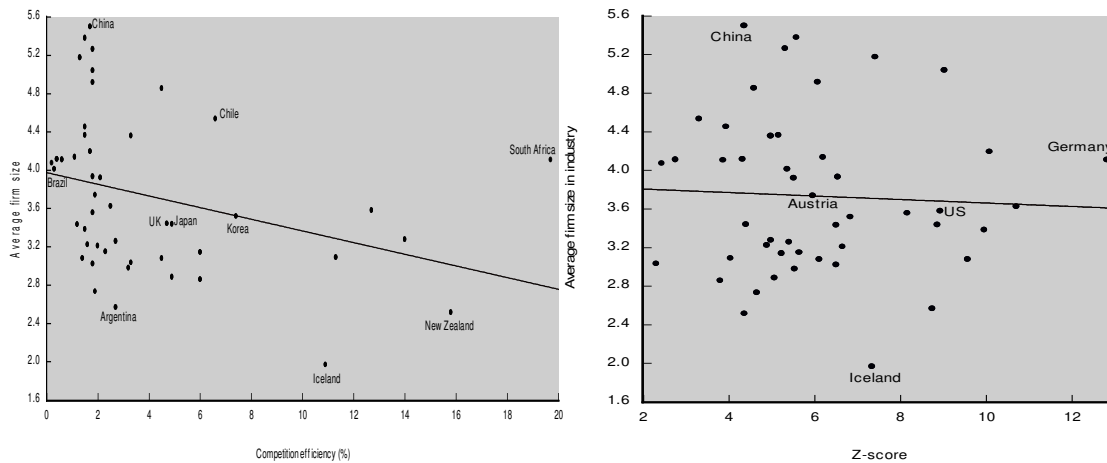
Table 3 presents the summary statistics of the country-specific variables. The average (compounded) sectoral real growth rate of value added is 2.8%. The average firm size measured by the natural log of the respective ratio, either value added or number of employed to number of establishments are approximately 14.1 and 3.7, (in antilog 1,329,083 and 40) respectively. The average sector requires some 36% of external financing for investment, while the figures for only young or old firms are 3.8% and 73.4%, respectively. Overall bank development measured as the ratio of domestic credit in the private sector to GDP is on average some 89% but with large variations across countries, from a low of 14% to a high of 190%. See also Table A2 in Appendix for correlation matrix among interested variables.

Figure 1: Bank Competition and the Stability Constraint versus Industry Growth



The figures plot country-specific estimate of the competition (left-hand side graph) and soundness (right-hand side graph) of banking sector for 48 emerging and advanced countries over 2001-2010 with the data on the average (compounded) growth rate of value added over 1993-2007. Bank competition (efficiency competition) captures the reallocation of market share to more efficient banks from their inefficient counterparts. Bank soundness is measured on a 3-year window of the Z-score.

Figure 2: Bank Competition and the Stability Constraint versus Average Firm Size



The figures plot our estimation of intensity of banking competition (left-hand side graph) and soundness (right-hand side graph) in each of 48 emerging and advanced countries over 2001-2010 versus the average firm size of industrial sectors over 1993-2007. Bank competition (efficiency competition) captures the reallocation of market share to more efficient banks from their inefficient counterparts. Bank soundness is measured on a 3-year window of the Z-score. Average firm size is measured as the natural log of the ratio of employment to establishments, averages over both sector and country.

Table 3: Summary statistics

	Mean	Median	Max.	Min.	Sta. Dev.	Obs.
<u>Industry variables</u>						
Industry growth (average compounded)	0.028	0.025	0.248	-0.154	0.060	928
Firm's size (log of value added to no. of establishments)	14.064	13.924	19.894	9.129	1.589	1046
Firm's size (log no. of employment to no. of establishments)	3.747	3.686	7.245	-0.420	1.219	1044
Industry's share in total industry value added	0.045	0.033	0.447	0.000	0.047	928
External finance dependence (all firms)	0.358	0.240	1.490	-0.450	0.414	23
External finance dependence (mature firms)	0.038	0.100	0.390	-0.950	0.270	23
External finance dependence (young firms)	0.734	0.715	2.060	-0.440	0.506	23
<u>Financial development variables</u>						
Domestic credit to private sector/GDP	89.359	87.906	190.433	13.797	52.347	48
Bank credit/GDP	106.220	104.205	308.514	19.421	58.169	48
Stock market capitalization/GDP	75.007	63.514	250.058	6.871	49.162	48
Stock market turnover ratio	73.346	64.077	240.705	0.754	53.602	48
<u>Banking variables</u>						
Concentration (5-firm) ratio (%)	66.526	68.684	96.929	21.629	18.246	48
Concentration (HH index)	2387	1827	7311	387	1633	48
Competition (H-statistics)	0.610	0.620	1.006	0.009	0.175	48
Competition (Lerner index)(%)	26.948	25.973	49.424	7.489	7.548	48
Efficiency competition (%)	4.033	2.000	19.700	0.200	4.273	48
Non-performing loans to total Loans (%)	5.760	4.786	25.936	0.245	5.006	48
Z-index	6.461	5.642	16.806	2.437	2.598	48
<u>Institutional variable</u>						
Property rights	6.708	7.000	9.000	2.857	2.106	48

Note: This table reports the summary statistics of the main regression variables. Definitions and data sources of the variables are in Table 1. Source: BankScope (Bureau Van Dijk), UNIDO Database, World Bank Database, Barth et al. (2001), Demircuc-Kunt et al. (2004), Heritage Foundation, and estimation by this study.

4 Empirical Results

Given the nature of the data that covers industry and country over the same time span, we take OLS as our empirical estimating technique. In order to ensure distinct effects between bank competition, the constraint of bank stability and bank market development, we include the bank development variable in the estimation. The inclusion of both the bank development and competition variable in the same model was evident in the study by Cetorelli and Gambera (2001), Claessens and Laeven (2005), and Maudos & Fernandez de Gambera (2006). We augment their study by making a further distinction between bank development, bank market structure, bank stability constraint, and bank competition. When banks are involved in rival competition, efficient banks can grow by taking more market share from inefficient banks, which inevitably leads to a more concentrated market structure in the long run. To see if this competitive process can be found, we need the inclusion of two separate variables in the estimation in order to capture the market structure and rival competition effects respectively on growth. This specification is distinctive from existing studies that assume the market structure as a key determinant of competition and thus applies the

structure to estimate competition (Rajan and Zingales (1998), King and Levine (1993a), Levine and Zervos (1998), Cetorelli and Gambera (2001), and Cetorelli (2004).

Claessens and Laeven (2005) argue the quality of financial information and the development of property rights protection can affect growth. In considering the argument, we use country dummies to capture any characteristic time-invariant effects of an economy on the growth, including the information quality. We also introduce a variable for property rights protection in the regression in order to see if the variable will be related to industrial growth as seen in other studies (e.g. Back, 2003).

Regarding financial dependence in relation to growth, raised by Rajan and Zingales (1998), usually there are two empirical strategies to estimate its relation to growth. One is to directly estimate it using the dependence variable, and another is to integrate the dependence with other explanatory variables, in which the latter approach has been applied by King and Levine (1993a), Levine and Zervos (1998), Cetorelli and Gambera (2001) and Cetorelli (2004). To follow these studies, we integrate the dependence with the explanatory variables in estimation.

Bank competition and non-financial industry growth

In Table 4, we present our estimation of the spillover effect of bank competition on the nonfinancial industrial growth. Industrial growth is the dependent variable, defined as the average (compounded) real growth rate over the period 1993-2007 of the value added of each sector in each country, according to Cetorelli and Gambera (2001), with one observation per sector in each country (See Tables A3 and A4 in Appendix for average industry growth among countries and industries, respectively). Apparently, our estimation shows that the industrial sectors relying on more external finance tend to develop faster in countries where there is more financial development, since the coefficient of the variable of bank development, interacted with financial dependence, is statistically positive in three out of six regressions (Columns 1, 3 and 4). A similar result is also observed by Cetorelli and Gambera (2001). Furthermore, for a given financial development (*Bank development*), the effect of market concentration on growth (Column 1) appears as significant but the significance is not robust when the efficiency competition variable is added into the model (Column 4). This is because the competition variable becomes more dominant in affecting growth when the large leading banks behave competitively as is the same as other banks. The dominance of competition over concentration in affecting the growth in the column 4 reflects an

econometric phenomenon that the correlation between the two variables weakens either one or another's effect on the explained variable in the estimation. This correlation shows that the information of rival competition is embedded in the concentration. Therefore, the link of this embedment with the respective competition and the concentration impacts on the growth leads us to understand the evident relationship of competition and concentration with growth as '*the competitively driven concentration promotes growth*'. This is to say, a more concentrated banking market can benefit growth if market concentration arises from the process of rival competition. For instance, rival competition can make the large banks more aggressive not only in lending but also in investing in their client relationship in order to secure a market position. This argument adds a new thought in explaining the lending-relationship investment for growth promotion in the context of the rival competition. In contrast, if the concentration has not resulted from a rival process, then the concentration can lower competitive pressures on the large leading banks in supplying more credits to the industries and so affect growth adversely, which was phenomenon found by Cetorelli and Gambera (2001).

When the process is non-rivalry, we expect a negative relationship of the bank-market concentration with industrial growth. Otherwise, if the process is rivalry, a positive impact of the concentration should be expected. In our regressions, the efficiency competition measures how rival banks are in taking their cost or quality advantages to compete in the market. The inclusion of both the rival efficiency competition and the market concentration variables in the model shows how the concentration has evolved: the rival-competition-driven process of banks to be large drives efficient banks more aggressively in providing industries with a more favorable access to bank finance and so stimulates their growth. Our empirical support for this argument is established by taking into account the effect of bank stability constraint on growth. The stability of a bank is essential for growth and a more stable banking system can promote growth, which is evident by our estimation of the stability constraint on growth, see Columns 3 and 4 in Table 4.

With the findings above, our estimation further identifies a positive role of quality information and of development of property rights protection in stimulating economic growth, which is the attempt made by Claessens and Laeven (2005) to find in their study of how the quality of financial information or improved property rights protection could affect growth.

Table 4: The effect of bank competition and stability on industry growth

	(1)	(2)	(3)	(4)	(5)	(6)
Share in value added	-0.031*** (-3.03)	-0.033*** (-3.27)	-0.034*** (-3.36)	-0.031*** (-3.01)	-0.037** (-2.03)	-0.035*** (-3.43)
<i>Financial development</i>						
Bank development*FD	0.046* (1.80)	0.032 (1.22)	0.058** (2.15)	0.050* (1.83)	-0.010 (-0.34)	0.008 (0.23)
<i>Bank concentration</i>						
5-firm ratio*FD	0.133** (2.07)			0.085 (1.28)		
<i>Bank competition</i>						
Efficiency competition*FD		0.060*** (2.97)		0.048** (2.23)		0.048** (2.29)
<i>Bank stability</i>						
Z-score*FD			0.453** (2.14)	0.358* (1.67)		0.353* (1.65)
<i>Regulation</i>						
Property rights*FD					0.164* (1.94)	0.121 (1.63)
Industry dummies (23 sectors)	Yes	Yes	Yes	Yes	Yes	Yes
Country dummies (48 countries)	Yes	Yes	Yes	Yes	Yes	Yes
Number of countries	48	48	48	48	48	48
Observations	928	928	928	928	928	928
R-squared	0.45	0.45	0.45	0.46	0.45	0.46
S.E of regression	0.21	0.21	0.21	0.21	0.21	0.21
F-statistics	9.71***	9.82***	9.72***	9.65***	9.73***	9.67***

Notes: The dependent variable is the average (compounded) real growth of value added over the period 1993-2007. Share in value added is the fraction of value added of each sector in each country in the year 1993. FD is the external financial dependence of each sector taken from Rajan and Zingales. Definitions and data sources of the variables are in Table 2. Regressions are estimated using OLS and include industry and country dummies (not reported). Robust t-values are in parentheses. * Significant at 10%, ** Significant at 5% and *** Significant at 1%.

Bank competition and the market structure of nonfinancial industry

We next investigate whether the competitive and stable state of a banking sector affects the market structure of nonfinancial industries. Specifically, we test whether after controlling for bank stability rival competition can create spillover effects on lowering the average firm size of nonfinancial industries by facilitating their entry activities. For the given stability of banks, more bank competition would be expected to improve the access of industries to finance, especially for young firms, and therefore to facilitate entries. On the basis of this expectation, a low financial barrier to entry helps reduce the average size of the firm in an industry. To test this hypothesis empirically, we estimate equation (3). The explained variable here is the average size of the firm, which implies a market structure of an industry – the lower average size of the firm the less concentrated market structure is. Tables A5 and A6, in the Appendix, show the pattern of the average firm size across countries and across industrial sectors, respectively.

With the argument above, we expect that the growth of industries or sectors with more reliance on external finance will be particularly influenced by the spillover effect of bank competition. This explains why we integrate competition, stability and other variables with

the financial dependence for our estimation. In Table 5 we present the results of our estimation where in Panel A the dependent variable is the natural log of the ratio of value added to the number of firms and in Panel B the dependent variable is the natural log of ratio of the employees to the firms. By controlling the impact of the size of the industry on its own structure, see Cetorelli (2004), we find that the overall bank development variable (*Bank development*) is consistently, negatively and significantly related to the average size of the firm in five out of twelve regressions, indicating that bank development promotes entries into industries.

Having controlled the financial development effect, Table 5 shows further that bank competition is negatively related to the structure of the industries. More bank competition provides financially-dependent industries with better access to credits and therefore more entries are facilitated. When banks grow via rival competition, indicated by efficiency competition, the process of the concentration becomes competitive. Inevitably, this competitive process will facilitate the growth of new firms and so lead to diversification of the structure of the nonfinancial industry. This is evidenced in our estimation in Table 5, which is different from the finding of Cetorelli (2004) that might capture the non-competitive process of the concentration.

By including both competition and concentration in the estimation, see column 4 of Table 5, we see both variables are significantly and negatively related to the average size of the firm in other sectors, suggesting that rival competition and rival-competition-driven concentration play a consistent role in facilitating entries. This finding is consistent with the evidence presented in Table 4 of which competition and competition-driven concentration promote growth. Competition consistently impacts on both growth and structure which implies that the mechanism of the spillover effect is that competition drives growth via facilitating credit support to the growth of new business. Overall, Table 5 suggests that bank competition does matter for the market structure of manufacturing industries.

Table 5: The effect of bank competition and stability on average size of a firm in an industry

Panel A: Average firm size measured in terms of value added						
	(1)	(2)	(3)	(4)	(5)	(6)
Share in value added	0.392*** (17.45)	0.402*** (18.19)	0.403*** (18.23)	0.394*** (17.57)	0.422*** (19.10)	0.420*** (18.96)
<i>Financial development</i>						
Bank development*FD	-0.128* (-1.84)	-0.075 (-1.07)	-0.137* (-1.92)	-0.110 (-1.50)	-0.251*** (-2.63)	-0.234** (-2.37)
<i>Bank concentration</i>						
5-firm ratio*FD	-0.453*** (-2.68)			-0.312* (-1.73)		
<i>Bank competition</i>						
Efficiency competition*FD		-0.153*** (-2.92)		-0.110* (-1.94)		-0.086* (-1.79)
<i>Bank stability</i>						
Z-score*FD			-0.884 (-1.50)	-0.526 (-0.88)		-0.267 (-0.45)
<i>Regulation</i>						
Property rights*FD					-1.085*** (-5.48)	-0.993*** (-4.84)
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes
Country dummies	Yes	Yes	Yes	Yes	Yes	Yes
Number of countries	48	48	48	48	48	48
Observations	1046	1046	1046	1046	1046	1046
R-squared	0.84	0.84	0.84	0.84	0.85	0.85
S.E of regression	0.65	0.65	0.65	0.65	0.65	0.65
F-statistics	72.42***	72.53***	71.98***	70.77***	74.41***	72.52***
Panel B: Average firm size measured in terms of employment						
	(1)	(2)	(3)	(4)	(5)	(6)
Share in value added	0.279*** (12.50)	0.289*** (13.11)	0.291*** (13.13)	0.281*** (12.61)	0.308*** (13.99)	0.307*** (13.91)
<i>Financial development</i>						
Bank development*FD	-0.060 (-0.99)	-0.013 (-0.21)	-0.066 (-1.03)	-0.056 (-0.84)	-0.291* (-1.69)	-0.272 (-0.98)
<i>Bank concentration</i>						
5-firm ratio*FD	-0.475*** (-3.21)			-0.376** (-2.38)		
<i>Bank competition</i>						
Efficiency competition*FD		-0.125*** (-2.73)		-0.077* (-1.76)		-0.061* (-1.71)
<i>Bank stability</i>						
Z-score*FD			-0.756 (-1.45)	-0.553 (-1.06)		-0.301 (-0.58)
<i>Regulation</i>						
Property rights*FD					-0.990*** (-5.71)	-0.918*** (-5.09)
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes
Country dummies	Yes	Yes	Yes	Yes	Yes	Yes
Number of countries	48	48	48	48	48	48
Observations	1044	1044	1044	1044	1044	1044
R-squared	0.79	0.79	0.79	0.79	0.79	0.79
S.E of regression	0.57	0.57	0.58	0.57	0.57	0.57
F-statistics	50.13***	49.94***	49.59***	48.93***	51.57***	50.22***

Notes: The dependent variable is the natural logarithm of average either value added or employment per firm in each sector and in each country over the period 1993-2007. Share in value added is the fraction of value added of each sector in each country in year 1993. FD is the external financial dependence of each sector taken from Rajan and Zingales. Definitions and data sources of the variables are in Table 2. Regressions are estimated using OLS and include industry and country dummies (not reported). Robust t-values are in parentheses. * Significant at 10%, ** Significant at 5% and *** Significant at 1%.

5 Robustness tests

In order to test the sensitivity of our results, we conduct a number of robustness tests in this section with different specifications of variables and samples. We divide the robustness tests into two sub-sections. The first sub-section presents the robustness tests for the respective

spillover effect of bank competition and concentration on industry growth, and the second sub-section reports the robustness tests for the effect of bank competition and concentration on the market structure of the industry.

5.1. Robustness tests for industry growth

Instrumental variables

The first issue concerns the potential endogeneity of the market structure of the banking sector, although Claessens and Laeven (2005) state that by using the Rajan and Zingales' methodology the endogeneity or omitted variables concern should not exist. However, we address the potential endogeneity issue by using instrumental variables (IV) in our estimation. We use three variables as instruments. The first variable determining a country's institutional characteristics is an indicator of the legal origin of a country. The next two variables, which proxy for market size, are total population and one-year lagged GDP (measured in US dollars) of the country⁵. These types of instrumental variables are already used by a number of studies (e.g. Cetorelli and Gambera, 2001). In order to check the overidentifying restriction for each of the IV regression, we perform a Durbin-Wu-Hausman (DWH) F-test. As shown in Table 6, our estimates are very consistent with or without the endogeneity problem taken into account. The instrumented bank concentration variable is still positively related to industrial growth.

⁵ The data of GDP and population are collected from WDI, World Bank. Both variables are transformed into logarithms for estimation. The variable of legal origin is retrieved from World Bank (2004).

Table 6: Instrumental variables

	(1)	(2)	(3)	(4)
Share in value added	-0.029*** (-2.73)	-0.031*** (-3.03)	-0.032*** (-3.08)	-0.035*** (-3.38)
<i>Financial development</i>				
Bank development*FD	0.042 (1.59)	0.030 (1.13)	0.053* (1.93)	-0.012 (-0.35)
<i>Bank concentration</i>				
5-firm ratio*FD	0.142** (2.15)			
<i>Bank competition</i>				
Efficiency competition*FD		0.060*** (2.87)		
<i>Bank stability</i>				
Z-score*FD			0.470** (2.19)	
<i>Regulation</i>				
Property rights*FD				0.161** (2.15)
Industry dummies	Yes	Yes	Yes	Yes
Country dummies	Yes	Yes	Yes	Yes
Number of countries	46	46	46	46
Observations	893	893	893	893
R-squared	0.45	0.45	0.45	0.45
S.E of regression	0.22	0.22	0.22	0.22
Wald chi-square	678.37***	684.95***	452.15***	678.38***
Durbin-Wu-Hausman	6.07	5.45	19.61***	18.03***

Notes: The dependent variable is the average (compounded) real growth in sectoral value added over the period 1993-2007. Share in value added is the fraction of value added of each sector in each country in year 1993. FD is the external financial dependence of each sector taken from Rajan and Zingales. Definitions and data sources of the variables are in Table 2. Regressions are estimated using instrumental variables and include industry and country dummies (not reported). As instrument for bank development, concentration, competition and stability we use the legal origin dummy, population and GDP indicator of the country. The Durbin-Wu-Hausman statistic tests the null hypothesis that the use of instrumental variables does not change the estimation outcome. Robust t-values are in parentheses. * Significant at 10%, ** Significant at 5% and *** Significant at 1%.

Sensitivity to initial financial development

It is argued that the influence of financial development and bank competition and stability on economic growth is not concurrent but impacts future growth. Hence, we further test the effect of initial financial development and banking performance on the industrial growth for the period under study. More specifically, the financial development variable (*Bank development*) is defined on the basis of the year 1993; the variable of property right is taken from the related database for year 1995 as this is the earliest year that the data could go. For bank efficiency competition, the reference period of the measure is based on 2001-2005 because we need to estimate the efficiency competition over several years (we choose a period of 5 years) to have enough observations for each country, so it is impossible to estimate the model for only one year (initial year). By the same analogy, the Z-score is defined on the basis of a 3-year rolling window, implying that the initial z-score variable is for 2003. With these different specifications of variables, Table 7 presents the estimated results that are very much consistent with findings we have identified.

Table 7: Effect of bank competition and stability on industry growth (using initial financial development indicators)

	(1)	(2)	(3)	(4)	(5)	(6)
Share in value added	-0.037*** (-3.18)	-0.028*** (-2.79)	-0.041* (-1.95)	-0.026** (-2.53)	-0.044*** (-3.72)	-0.027*** (-2.69)
<i>Financial development</i>						
Bank development(1993)*FD	0.006 (0.20)	-0.003 (-0.13)	-0.025 (-0.84)	0.012 (0.45)	-0.051 (-1.55)	-0.019 (-0.62)
<i>Bank concentration</i>						
5-firm ratio(2001)*FD	0.211*** (3.03)			0.145** (2.35)		0.147** (2.28)
<i>Bank competition</i>						
Efficiency competition(2001-05)*FD		0.016*** (3.91)		0.023** (2.60)		0.012* (1.79)
<i>Bank stability</i>						
Z-score(2003)*FD			0.144*** (2.91)	0.012** (2.36)		0.003 (0.03)
<i>Regulation</i>						
Property rights (1995)*FD					0.217*** (2.68)	0.201*** (2.88)
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes
Country dummies	Yes	Yes	Yes	Yes	Yes	Yes
Number of countries	48	48	48	48	48	48
Observations	928	928	928	928	928	928
R-squared	0.40	0.45	0.40	0.45	0.40	0.46
S.E of regression	0.25	0.21	0.25	0.21	0.25	0.21
F-statistics	8.00***	9.63***	7.83***	9.63***	7.85***	9.55***

Notes: The dependent variable is the average (compounded) real growth in sectoral value added over the period 1993-2007. Share in value added is the fraction of value added of each sector in each country in year 1993. FD is the external financial dependence of each sector taken from Rajan and Zingales. Definitions and data sources of the variables are in Table 2. Regressions are estimated using OLS and include industry and country dummies (not reported). Robust t-values are in parentheses. * Significant at 10%, ** Significant at 5% and *** Significant at 1%.

Sensitivity to different sample period

To further explore the robustness of our findings, we change sample periods in our estimation. So far, the data from which we have estimated the dependent variable (growth in value added) covered the period 1993-2007 do not exactly match to the period 2001-2010 for the efficiency competition. To address the different time spans, we re-specify the dependent variable for the period 2001-2007, and redefine 2001 as the initial year for the variable of the share in value added. With the re-specification of growth and the initial output, our estimated results are still consistent with our finding that bank competition and bank concentration play a positive role in stimulating growth when the bank stability remains, see Table 8.

Table 8: Effect of bank competition and stability on industry growth over the period 2001-2007

	(1)	(2)	(3)	(4)	(5)	(6)
Share in value added	-0.036*** (-2.78)	-0.040*** (-3.06)	-0.041*** (-3.15)	-0.036*** (-2.76)	-0.044*** (-3.38)	-0.041*** (-3.18)
<i>Financial development</i>						
Bank development*FD	0.050 (1.52)	0.030 (0.92)	0.064* (1.86)	0.055 (1.58)	-0.012 (-0.28)	0.009 (0.20)
<i>Bank concentration</i>						
5-firm ratio*FD	0.187** (2.28)			0.127 (1.49)		
<i>Bank competition</i>						
Efficiency competition*FD		0.078*** (2.99)		0.060** (2.19)		0.064** (2.38)
<i>Bank stability</i>						
Z-score*FD			0.590** (2.17)	0.466* (1.70)		0.477* (1.74)
<i>Regulation</i>						
Property rights*FD					0.171* (1.87)	0.127 (1.38)
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes
Country dummies	Yes	Yes	Yes	Yes	Yes	Yes
Number of countries	48	48	48	48	48	48
Observations	928	928	928	928	928	928
R-squared	0.42	0.40	0.42	0.43	0.42	0.43
S.E of regression	0.27	0.27	0.27	0.27	0.27	0.27
F-statistics	8.68***	8.77***	8.67***	8.64***	8.64***	8.63***

Notes: The dependent variable is the average (compounded) real growth in sectoral value added over the period 2001-2007. Share in value added is the fraction of value added of each sector in each country in year 2001. FD is the external financial dependence of each sector taken from Rajan and Zingales. Definitions and data sources of the variables are in Table 2. Regressions are estimated using OLS and include industry and country dummies (not reported). Robust t-values are in parentheses. * Significant at 10%, ** Significant at 5% and *** Significant at 1%.

Sensitivity to different measures of financial sector development

For the robustness test, we also change the specification of the financial development variable from the credit provision measurement to the private sector (*Bank development*) as % of GDP. We also add another two variables of, respectively, stock market capitalization in GDP or stock turnover ratio to further pick up the development of finance in estimation. In addition, we define 1993 as the initial year for the financial development. These changes allow us to test the robustness of the financial development to growth in terms of different specifications of the development: the orientation of the country's financial sector toward banking intermediation, the scale of capital market relative to the economy, and the initial financial development. With these specifications, in Table 9, the estimated results do not regard the initial development as a significant determinant to growth. In contrast, for a given bank stability, bank competition still affects growth strongly, observed in all of columns in Table 9.

Table 9: Bank performance vs. overall financial development, and industry growth

	(1)	(2)	(3)	(4)	(5)	(6)
Share in value added	-0.030*** (-3.01)	-0.028*** (-2.77)	-0.030*** (-3.03)	-0.027*** (-2.63)	-0.032*** (-3.13)	-0.034*** (-3.35)
<i>Average financial development</i>						
Bank credit*FD	0.022 (0.67)					
Market capitalization*FD		-0.033 (-1.10)				
Market activity*FD			0.016 (0.79)			
<i>Initial financial development</i>						
Bank credit-1993*FD				-0.018 (-0.63)		
Market capitalization-1993*FD					0.008 (0.68)	
Market activity-1993*FD						0.080*** (3.11)
<i>Bank competition</i>						
Efficiency competition*FD	0.059*** (2.89)	0.066*** (3.16)	0.061*** (3.00)	0.058*** (2.80)	0.070*** (3.36)	0.085*** (4.10)
<i>Bank stability</i>						
Z-score*FD	0.281 (1.35)	0.212 (1.02)	0.297 (1.40)	0.234 (1.17)	0.354* (1.72)	0.376* (1.86)
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes
Country dummies	Yes	Yes	Yes	Yes	Yes	Yes
Number of countries	48	48	48	47	42	41
Observations	928	928	928	914	818	800
R-squared	0.45	0.45	0.45	0.45	0.48	0.49
S.E of regression	0.21	0.21	0.21	0.21	0.21	0.20
F-statistics	9.69***	9.71***	9.69***	9.77***	10.36***	10.47***

Notes: The dependent variable is the average (compounded) real growth in sectoral value added over the period 1993-2007. Share in value added is the fraction of value added of each sector in each country in year 1993. FD is the external financial dependence of each sector taken from Rajan and Zingales. Definitions and data sources of the variables are in Table 2. Regressions are estimated using OLS and include industry and country dummies (not reported). Robust t-values are in parentheses. * Significant at 10%, ** Significant at 5% and *** Significant at 1%.

Sensitivity to alternative measures of competition and stability

In order to check the sensitivity of our results to different measures of competition, we consider 5 different measures of bank competition: the Herfindahl-Hirschman Index as a measurement of market structure as an indication of competition, the Lerner index as an indication of a firm's market power to charge prices, Panzar and Rosse *H*-statistics as a non-structural approach to measure competition, and bank freedom and bank restriction as the indication of free market entry. We estimate the Lerner index as price-marginal cost spread as percentage of price, where price marginal cost is estimated from a translog cost function. We obtain the *H*-statistic based on the estimation of a revenue function and calculate the sum of elasticities of revenue with respect to input prices. Banking freedom and activity restriction is reflected by a degree of regulatory control. We test these five indicators because they are unlikely to be substitutable for each other. For example, the existing studies by Fernández de Guevara et al., (2005) and Carbó et al. (2006) show that there is very little correlation between the Lerner index and the concentration ratio. Also, Claessens and Laeven (2004) and Carbó et al. (2006) show a low correlation between *H*-statistics and the indicators of market

concentration. With these changes in the specification of competition, we also re-specify bank stability as the non-performing loans in the total loans in order to see the robustness of the variable in the estimation.

Table 10: Bank competition and growth: using to alternative indicators of bank competition

	(1)	(2)	(3)	(4)	(5)	(6)
Share in value added	-0.035*** (-3.37)	-0.038*** (-3.72)	-0.037*** (-3.67)	-0.037*** (-3.63)	-0.035** (-2.27)	-0.037*** (-3.66)
<i>Financial development</i>						
Bank development*FD	-0.005 (-0.15)	-0.010 (-0.28)	-0.011 (-0.32)	-0.009 (-0.26)	-0.012 (-0.24)	-0.008 (-0.24)
<i>Different indicators of competition</i>						
HHI index*FD	0.051* (1.75)					
Lerner index*FD		0.086 (1.32)				
H-statistics*FD			-0.016 (-0.55)			
Banking freedom*FD				0.011 (0.14)		
Bank activity restriction*FD					0.083 (1.09)	
<i>Different indicator of stability</i>						
Non-performing loans*FD						0.028 (1.05)
<i>Regulation</i>						
Property rights*FD	0.144* (1.95)	0.170** (2.32)	0.168** (2.29)	0.159* (1.69)	0.183** (1.96)	0.203** (2.47)
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes
Country dummies	Yes	Yes	Yes	Yes	Yes	Yes
Number of countries	48	48	48	48	47	48
Observations	928	928	928	928	909	928
R-squared	0.45	0.45	0.45	0.45	0.45	0.45
S.E of regression	0.21	0.21	0.21	0.21	0.21	0.21
F-statistics	9.66***	9.63***	9.59***	9.58***	9.48***	9.61***

Notes: The dependent variable is the average (compounded) real growth in sectoral value added over the period 1993-2007. Share in value added is the fraction of value added of each sector in each country in year 1993. FD is the external financial dependence of each sector taken from Rajan and Zingales. Definitions and data sources of the variables are in Table 2. Regressions are estimated using OLS and include industry and country dummies (not reported). Robust t-values are in parentheses. * Significant at 10%, ** Significant at 5% and *** Significant at 1%.

Table 10 presents the results of the tests. We find that stability measured by non-performing loans is insignificant, suggesting that the stability effect on growth is sensitive to different measurements. Furthermore, in terms of the 5 measurements of competition, only the HHI comes up positively in relation to growth, which is consistent with the effect of concentration. The failure of others may be due to an inherent limitedness in capturing the non-cooperative process of competition. It is argued that the non-cooperative or rival process of competition is a key driver to create the competitive effect that can powerfully and significantly be spilled over to influence the growth of other industries. This argument is demonstrated by the contrast of our testing results between using the efficiency competition and other estimations of competition. In short, the different states or processes of bank competition matter for growth.

Sensitivity to different sub-sample countries (emerging vs. advanced economies)

For our further test to the robustness of competition effects on growth, we divide our data into two subsamples according to emerging and advanced economies. Table 11 presents the estimation results with a subsample of countries. In Panel A, we include 23 emerging countries, while in Panel B we include 25 advanced countries. Interestingly, the effect of efficiency competition on growth is much robust and stronger for developed markets than for the emerging markets. This exactly reflects an economic development stage that matters for market competition and its role in an economy: bank competition can facilitate growth more robustly for economies where market development is more advanced.

Interestingly, in Panel A of Table 11, we also observe that the concentration is more robust in an emerging market than in the developed. The concentration of large banks can strengthen a bank's capability to finance business, particularly, those large development projects set up by governments for growth. Large banks can also be conducive to governments in using them as an effective instrument to serve its development interest and growth policy, for instance, China's large state-owned banks. With this context, when competition is absent or weak, the high concentration of large banks can still be conducive to growth via government's role or intervention to finance provision, which is observed in our sample of emerging markets.

In contrast, when the bank market is highly competitive and rivalrous, large banks will be driven more aggressively in order to hold their market position. In this situation, the supply of finance from large banks will be more active in helping to stimulate growth. This expectation implies a positive relationship between bank concentration and growth, but empirically it may not be observable, depending on how the concentration is formed. If it is formed by a leading bank or a leading group of banks that possess a dominant power to influence the market, the relationship can be empirically observed. Otherwise, if the concentration is formed by less or weakly dominant leading banks, for instance due to low entry barriers, the relationship can be unobserved, because the leading banks have no or very weak power to influence the market. With this weak dominance, on the one hand, the concentration cannot imply the market power that enables the large banks to create its distinctive effect on growth. On the other hand, the competitive behaviour of the large banks, which is same as others, can be reflected by the market state of competition. This dominance view explains why the concentration related to growth is not shown but efficiency competition still does in Panel B of Table 11.

Interestingly, it can be noticed in Table 11 that countries experience high growth when their banks are more financially stable in advanced economies but not in emerging economies. This indicates that in the advanced markets the financial stability is a hard constraint on the banks in lending to industry, and the improvement of stability can reduce the lending constraint and so promote growth. In contrast, banks in emerging economies are not constrained by the financial stability for their lending, and therefore, growth is not related to the stability constraint. The decoupling of bank stability from both lending and growth implies that the banks in emerging regions are not fully commercialised with a soft stability constraint due to the possible intervention of the governments in prioritising development interests above the concern of the bank's risk constraint on lending, particularly, for large banks. This explains consistently why concentrated large banks promote growth but the stability constraint decouples from growth in emerging economies. The contrast of bank stability constraints between the two regions enriches our insights about why the bank crisis in 2008 more severely hit growth in developed economies than in emerging economies.

Table 11: The effect of bank competition and stability on growth: emerging versus advanced

	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: emerging economies						
Share in value added	-0.049*** (-2.79)	-0.052*** (-2.97)	-0.056*** (-3.21)	-0.047* (-1.93)	-0.057*** (-3.29)	-0.053*** (-3.02)
<i>Financial development</i>						
Bank development*FD	0.006 (0.131)	0.004 (0.08)	0.008 (0.15)	-0.025 (-0.55)	-0.003 (-0.07)	-0.051 (-0.94)
<i>Bank concentration</i>						
5-firm ratio*FD	0.276** (2.10)			0.220* (1.68)		
<i>Bank competition</i>						
Efficiency competition*FD		0.064* (1.78)		0.056* (1.67)		0.064* (1.74)
<i>Bank stability</i>						
Z-score*FD			-0.243 (-0.69)	0.098 (1.02)		0.154 (1.46)
<i>Regulation</i>						
Property rights*FD					0.193* (1.75)	0.201* (1.77)
Number of countries	23	23	23	23	23	23
Observations	434	434	434	434	434	434
R-squared	0.44	0.43	0.43	0.44	0.43	0.44
S.E of regression	0.24	0.24	0.24	0.24	0.24	0.24
F-statistics	6.35***	6.31***	6.21***	6.16***	6.30***	6.18***
Panel B: advanced economies						
Share in value added	-0.026* (-1.88)	-0.030** (-2.26)	-0.024* (-1.81)	-0.026* (-1.90)	-0.030** (-2.21)	-0.029** (-2.17)
<i>Financial development</i>						
Bank development*FD	0.106 (1.32)	0.135* (1.76)	0.086 (1.21)	0.163** (1.99)	0.036 (0.49)	0.107 (1.32)
<i>Bank concentration</i>						
5-firm ratio*FD	0.105 (1.39)			0.034 (0.44)		
<i>Bank competition</i>						
Efficiency competition*FD		0.070*** (2.73)		0.055** (2.12)		0.045* (1.68)
<i>Bank stability</i>						
Z-score*FD			0.985*** (3.85)	0.193*** (3.22)		0.228*** (3.67)
<i>Regulation</i>						
Property rights*FD					0.142 (0.92)	0.249 (1.51)
Number of countries	25	25	25	25	25	25
Observations	494	494	494	494	494	494
R-squared	0.49	0.50	0.51	0.51	0.49	0.51
S.E of regression	0.19	0.19	0.19	0.19	0.19	0.19
F-statistics	8.76***	8.99***	9.28***	9.04***	8.72***	9.13***
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes
Country dummies	Yes	Yes	Yes	Yes	Yes	Yes

Notes: The dependent variable is the average (compounded) real growth in sectoral value added over the period 1993-2007. Share in value added is the fraction of value added of each sector in each country in year 1993. FD is the external financial dependence of each sector taken from Rajan and Zingales. Definitions and data sources of the variables are in Table 2. Regressions are estimated using OLS and include industry and country dummies (not reported). Robust t-values are in parentheses. * Significant at 10%, ** Significant at 5% and *** Significant at 1%.

5.2. Robustness tests of competition effect on industry market structure

Sensitivity to alternative indicators of competition

In this section we test the impact of alternative indicators of bank competition and the stability constraint on the market structure of industrial sectors. Specifically, we include three competition indicators: i.e. HHI index, Lerner index, and H-statistics plus non-performing loans as a proxy for the constraint of bank financial stability. Table 12 presents the estimated results. In contrast to the estimation of the competition effect on growth which is sensitive to the measure of competition, now our estimation of the effect on the structure is much less sensitive to the different measures of competition. This shows the robustness of the estimated relationship. Similarly, with different measures for the stability constraint, the variable specified by the non-performing loans appears still positively related to the market structure of the industry. This finding shows that with more non-performing loans, the banks face higher risk, imposing more stability constraint on bank lending in support of new entries to the industries. Thus, the stability constraint affects the structure of the industry.

Table 12: The effect of alternative indicators of bank competition and stability on average size of a firm in an industry

	Average firm size measured in terms of							
	Panel A: value added				Panel B: employment			
	(1)	(2)	(3)	(4)	(I)	(II)	(III)	(IV)
Share in value added	0.398*** (17.81)	0.404*** (18.43)	0.403*** (18.29)	0.408*** (18.53)	0.285*** (12.81)	0.288*** (13.12)	0.288*** (13.07)	0.292*** (13.27)
<i>Financial development</i>								
Bank development*FD	-0.106 (-1.52)	-0.086 (-1.24)	-0.100 (-1.45)	0.033 (0.42)	-0.036 (-0.57)	-0.020 (-0.32)	-0.031 (-0.50)	0.073 (1.04)
<i>Bank concentration</i>								
HHI index*FD	-0.135* (-1.74)				-0.129* (-1.92)			
<i>Bank competition</i>								
Lerner index*FD		0.819*** (4.84)				0.557*** (3.75)		
<i>H-statistic*FD</i>								
H-statistic*FD			-0.280*** (-3.30)				-0.214*** (-2.86)	
<i>Bank stability</i>								
Non-performing loans*FD				0.259*** (4.10)				0.189*** (3.62)
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of countries	48	48	48	48	48	48	48	48
Observations	1046	1046	1046	1046	1044	1044	1044	1044
R-squared	0.84	0.85	0.84	0.84	0.79	0.79	0.79	0.79
S.E of regression	0.65	0.65	0.65	0.65	0.58	0.57	0.58	0.57
F-statistics	72.05***	73.84***	72.74***	73.26***	49.70***	50.37***	49.99***	50.31***

Notes: The dependent variable is the natural logarithm of either value added or total employment by the total number of establishments in each sector in each country over the period 1993-2007. Share in value added is the fraction of value added of each sector in each country in year 1993. FD is the external financial dependence of each sector taken from Rajan and Zingales. Definitions and data sources of the variables are in Table 2. Regressions are estimated using OLS and include industry and country dummies (not reported). Robust t-values are in parentheses. * Significant at 10%, ** Significant at 5% and *** Significant at 1%.

Sensitivity to different sub-samples and specifications of market structure

In this section, our robustness test is made by looking at how sensitive our estimated relationship of bank competition to market structure of other industries is when our aggregate

sample is divided according to emerging and advanced economies respectively. We also change the measure of market structure from using the average output per firm to a more strict measurement that is a change in the number of firms in an industry over the sample time period. With these changes in Table 13 our new estimations show that, overall, there is more growth of new firms in industries of an economy where the rival competition appears in the banking system, regardless of emerging or advanced economies, although the latter seems to have a stronger effect on competition on new entries. The positive coefficient of bank competition related to the growth in the number of firms means more bank competition with more industrial entries. When rival competition appears, the bank concentration can be understood as a result of the process of the rival competition. The competitive process can drive the large leading banks more aggressive in supply of finance and so to better financially facilitate the entry of new firms to business. This expectation is evident by our significant estimation of the concentration variable in relation to the growth of the firms for both emerging and advanced economies respectively in Table 13. Apparently, our estimated relationship of bank competition to the structure is robust and consistent against tests with different conditions and specifications. Furthermore, the same is true for the effect of the bank stability constraint on structure. The improvement of the stability constraint measured by the z-score of the banks facilitates the growth of new firms in the industrial sector, shown in Table 13.

Table 13: Spillover Effect of Bank Competition on New Entries - Emerging vs Advanced Economies

	Growth of firms: $[N(t)-N(t-1)]/N(t-1)$			Growth of firms: $\ln(N(t)/N(t-1))$		
	(1)	(2)	(3)	(i)	(ii)	(iii)
Panel A: emerging economies						
Share in value added	-0.003* (-1.73)	-0.002 (-1.35)	-0.002* (-1.71)	-0.015*** (-2.82)	-0.016*** (-3.01)	-0.014*** (-2.72)
<i>Financial development</i>						
Bank development*FD	0.017* (1.80)	0.017* (1.78)	0.017* (1.68)	0.009* (1.69)	0.008 (0.39)	0.003 (0.17)
<i>Bank concentration</i>						
5-firm ratio*FD	0.021* (1.69)			0.048** (2.19)		
<i>Bank competition</i>						
Efficiency competition*FD		0.014* (1.76)			0.019* (1.79)	
<i>Bank stability</i>						
Z-score*FD			0.021** (2.14)			0.246*** (3.05)
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes
Country dummies	Yes	Yes	Yes	Yes	Yes	Yes
Number of countries	23	23	23	23	23	23
Observations	452	452	452	452	452	452
R-squared	0.47	0.46	0.46	0.39	0.39	0.39
S.E of regression	0.05	0.05	0.05	0.09	0.09	0.09
F-statistics	6.79***	6.77***	6.77***	5.67***	5.69***	5.70***
Panel B: advanced economies						
Share in value added	-0.003* (-1.79)	-0.002** (-2.29)	-0.002* (-1.87)	-0.006** (-1.98)	-0.007** (-2.23)	-0.007** (-2.36)
<i>Financial development</i>						
Bank development*FD	0.022** (2.24)	0.024* (1.72)	0.023* (1.65)	0.014* (1.75)	0.022 (1.18)	0.024 (1.36)
<i>Bank concentration</i>						
5-firm ratio*FD	0.004* (1.70)			0.021* (1.83)		
<i>Bank competition</i>						
Efficiency competition*FD		0.011* (1.77)			0.011** (2.18)	
<i>Bank stability</i>						
Z-score*FD			0.005 (0.30)			0.106* (1.83)
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes
Country dummies	Yes	Yes	Yes	Yes	Yes	Yes
Number of countries	25	25	25	25	25	25
Observations	538	538	538	538	538	538
R-squared	0.51	0.54	0.53	0.5	0.5	0.5
S.E of regression	0.03	0.03	0.05	0.05	0.05	0.05
F-statistics	18.45***	11.49***	14.33***	10.27***	10.21***	10.31***

Notes: The dependent variable is the growth of firms measured by either $\frac{N_t - N_{t-1}}{N_{t-1}}$ or $\log\left(\frac{N_t}{N_{t-1}}\right)$ where N is the number of establishments in each sector in each country in time t over the period 1993-2007. Share in value added is the fraction of value added of each sector in each country in year 1993. FD is the external financial dependence of each sector taken from Rajan and Zingales. Definitions and data sources of the variables are in Table 2. Regressions are estimated using OLS and include industry and country dummies (not reported). Robust t-values are in parentheses. * Significant at 10%, ** Significant at 5% and *** Significant at 1%.

6 Conclusions

Banks affect business and firms via finance. This explains why the performance of a banking system, such as competition and a stability constraint, is expected to impact the industry of an economy. This expectation is evident not only by this study but also by other existing studies. In this regards, one distinction of our paper is of its international scale and dimension of the research across 48 economies from the emerging markets to advanced countries over the

world. This study provides cross-country evidence on which there are higher industrial output growth and higher new business creation in economies where their banking systems are more competitive and stable.

Another distinction of this study is the pioneering attempt to measure rival competition by using the efficiency competition model as a new and direct measurement of competition in the context of the banking business. The key information embedded in the new measure is the state of competition – the non-cooperative process of banks in competing in the market for being large. As is evident by this study, the information enables the new measure to capture the spillover effect of bank competition on the growth of both outputs and new firms respectively in the non-financial industries.

The third distinction of the paper is to develop a new argument for the role of the market concentration of large banks in promoting growth. The concentration has been widely applied in banking studies as an indication of market power, and the higher power implies lower competition. This application can be misleading if the concentration of large leading banks arises from the process of rival competition. The rival or non-cooperative competition can stimulate large banks to be more aggressive in lending and investing in their client relationship in order to secure their market position, which in turn helps growth. The statistical verification of this argument has been made possible first by including both the concentration and the competition variable in estimation, secondly by checking the correlation between the two variables. As demonstrated by this study, the growth of industrial output is high in the economies where bank markets are more competitively concentrated.

When rival competition does not, or very weakly, appears, such as in emerging economies where markets are less developed, the role of concentration in promoting growth can be understood from the perspective of development. The capacity scale of large banks can be conducive to governments in employing them as an effective financial instrument in support of its development policy and growth projects. Therefore, it is not surprising to find out in our sample that the effect of the bank concentration is positive on growth for developing economies where competition is not strong.

The arguments above shall not be regarded as the replacement or substitution of the existing view that concentration reduces competition. Rather, our arguments extend the current limits in understanding concentration. We shall evaluate concentration according to how it is formed or developed. If it is formed by monopolization or cooperation or even by state

intervention, then the existing view is applicable. Otherwise, if it is formed by the competitive process, the concentration indicates competitive pressure from the market efficiency in selecting out less efficient banks.

The fourth distinction of the paper is the identification of the importance of bank financial stability constraint on lending that affects growth. Surprisingly, we find that the constraint of bank financial stability on growth varies with regions. In developed economies, the constraint is significantly harder on growth; and in the emerging economies, it is soft or decoupled from growth. This contrast may inspire us with new thoughts about why the 2008 bank crisis hit growth more severely in the West than in the emerging economies.

Overall, the evidence from this study shows that competition and large leading banks can promote growth and job creation via facilitating new entries to business. If large banks are helpful for the improvement of banking stability, which is as equally important as competition for growth, then the policy implication of this study is clear: we shall leave banks and market to decide its size and structure as long as the process to develop the structure and to be large is rivalry competitive.

Appendix

Table A.1: Mean values of bank concentration, competition and stability measures by country over 2001-2010 (emerging vs. advanced economies).

	No. of banks	Banking market structure and competition				Banking stability		
		5-firm conc.	HHI Index	H-statistic	Lerner index (%)	Efficiency compet. (%)	Non-perf. Loans (%)	Z-index
Emerging economies								
Argentina	60	52.20	870	0.554	26.57	2.70	14.01	2.44
Brazil	105	46.45	886	0.463	33.23	0.30	10.62	4.40
Chile	9	96.93	7311	0.715	24.71	6.60	1.04	5.53
China	81	73.81	1737	0.714	26.23	1.70	8.53	7.22
Colombia	17	59.94	1412	0.573	25.81	1.70	5.39	6.51
Czech Rep.	21	75.33	1699	0.618	32.83	1.60	6.65	6.11
Egypt	22	63.19	1637	0.343	46.41	1.30	25.94	5.41
Estonia	6	95.61	5654	0.525	28.89	1.50	3.23	4.36
Hungary	23	61.93	1536	0.553	33.33	1.20	3.90	4.99
India	59	44.57	1111	0.523	33.15	1.10	9.49	8.93
Indonesia	50	61.41	1127	0.585	28.61	1.80	6.96	6.84
Malaysia	26	36.97	971	0.595	28.11	1.50	10.04	8.87
Mexico	31	54.08	1687	0.645	28.76	1.50	4.62	4.65
Morocco	7	92.81	2982	0.129	54.81	0.40	6.93	10.71
Peru	14	85.20	3106	0.672	26.93	1.80	5.07	6.54
Philippines	23	70.40	3595	0.633	26.95	4.50	8.16	7.34
Poland	31	59.43	1119	0.701	17.90	6.00	21.61	5.64
Russia	523	58.55	1822	0.451	37.11	0.60	2.63	4.98
Slovak Rep.	14	77.46	1827	0.507	30.06	1.80	8.67	8.16
Slovenia	15	74.40	2206	0.692	23.72	4.90	7.15	4.04
South Africa	13	78.79	4228	0.828	17.82	19.70	9.01	6.65
Thailand	20	56.98	1028	0.294	30.64	1.50	11.99	5.23
Turkey	20	71.36	2312	0.599	30.87	2.10	8.50	5.96
Average	52	67.30	2255	0.561	30.15	2.95	8.70	6.15
Advanced economies								
Australia	15	79.28	4043	0.648	24.25	4.50	1.92	9.57
Austria	226	58.77	1516	0.688	29.63	1.90	1.92	5.52
Belgium	42	80.63	1585	0.862	19.69	6.00	3.29	5.16
Canada	57	68.68	1418	0.601	27.74	0.40	2.86	7.31
Denmark	83	77.43	2484	0.500	23.58	2.00	2.22	3.87
Finland	8	95.89	6019	0.692	21.46	11.30	0.60	5.06
France	197	53.12	1145	0.632	27.09	1.80	4.82	9.03
Germany	1551	38.91	556	0.620	20.80	3.30	5.08	12.82
Greece	14	82.60	3114	0.715	19.15	2.30	7.39	3.80
Iceland	11	92.69	3942	0.576	27.90	10.90	3.53	4.59
Ireland	10	51.91	3121	0.702	24.81	1.80	0.89	6.08
Israel	11	89.19	2153	0.009	35.06	2.50	7.20	4.32
Italy	377	57.28	1259	0.749	27.75	1.90	4.70	5.58
Japan	631	38.90	591	0.737	25.16	4.90	9.83	3.93
Korea	13	50.51	2030	0.666	23.04	7.40	1.85	5.31
Luxembourg	77	38.72	571	0.750	16.92	12.70	2.35	6.20
Netherlands	25	70.63	2269	1.006	19.74	14.00	1.82	6.50
New Zealand	5	95.33	6940	0.791	11.48	15.80	0.24	9.96
Norway	85	78.39	3296	0.609	25.33	2.70	1.39	7.42
Portugal	19	84.40	3349	0.612	25.87	1.40	2.38	4.89
Spain	108	63.49	1879	0.399	28.42	1.80	1.08	10.09
Sweden	83	75.89	4371	0.578	28.61	3.30	1.34	4.36
Switzerland	342	77.72	4423	0.713	25.08	3.20	2.54	16.81
UK	105	54.73	1856	0.623	22.49	4.70	5.21	5.36
US	556	21.63	387	0.501	32.46	1.20	0.84	8.75
Average	186	67.07	2573	0.639	24.54	4.95	3.09	6.89

Table A.2: Correlation matrix

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1)Industry growth									
(2)Average firm sizeI	-0.035								
(3)Average firm sizeII	0.092***	0.713***							
(4)Share in value added	-0.009	0.209***	0.178***						
(5)Financial dependence	0.082**	-0.078**	-0.074**	-0.159***					
(6)Bank development	-0.172***	0.208***	-0.168***	0.017	0.012				
(7)Concentration	0.060*	-0.182***	-0.135***	0.031	0.013	-0.153***			
(8)Competition	0.065**	-0.006	-0.168***	0.034	-0.006	0.267***	0.242***		
(9)Z-score	0.084***	-0.114***	-0.212***	-0.025	0.017	-0.180***	0.059*	-0.021	
(10)Property rights	-0.160***	0.174***	-0.329***	-0.006	0.042	0.657***	0.049	0.277***	-0.135***

Notes: This table reports the correlation matrix of the main regression variables. Industry growth is the average (compounded) real growth in sectoral value added. Average firm size I and II are the natural logarithm of either value added or total employment by the total number of establishments in each sector in each country. Share in value added is the fraction of value added of each sector in each country in year 1993. Financial dependence is the external financial dependence of each sector taken from Rajan and Zingales. Definitions and data sources of other variables are in Table 2. * Significant at 10%, ** Significant at 5% and *** Significant at 1%.

Table A.3: Average (compounded) growth of value added across countries (emerging vs. advanced economies).

Emerging economies	Growth	Advanced economies	Growth
Argentina	-0.0015	Australia	0.0307
Brazil	-0.0056	Austria	0.0186
Chile	0.0197	Belgium	0.0011
China	0.1603	Canada	0.0012
Colombia	0.0264	Denmark	0.0096
Czech Rep.	0.0723	Finland	0.0368
Egypt	-0.0003	France	0.0144
Estonia	0.0185	Germany	0.0144
Hungary	0.0972	Greece	0.0700
India	0.0764	Iceland	0.0108
Indonesia	0.0179	Ireland	0.0580
Malaysia	0.0081	Israel	0.0063
Mexico	0.0723	Italy	0.0250
Morocco	0.0352	Japan	-0.0387
Peru	0.0307	Korea	0.0266
Philippines	-0.0294	Luxembourg	0.0365
Poland	0.0683	Netherlands	0.0019
Russia	0.0780	New Zealand	0.0345
Slovak Rep.	0.0858	Norway	0.0353
Slovenia	0.0031	Portugal	0.0155
South Africa	0.0378	Spain	0.0441
Thailand	0.0202	Sweden	0.0314
Turkey	0.0362	Switzerland	-0.0355
		UK	0.0128
		US	0.0137
Average	0.0403	Average	0.0190

Notes: the figures for firm growth are calculated as simple averages for each country across all industries over 1993-2007.

Table A.4: Average (compounded) growth of value added across industries (emerging vs. advanced economies)

Isic	Sector	emerging	advanced
15	Food and beverages	0.0361	0.0239
16	Tobacco products	0.0159	-0.0028
17	Textiles	0.0024	-0.0194
18	Wearing apparel, fur	0.0141	-0.0364
19	Leather, leather products and footwear	-0.0001	-0.0262
20	Wood products (excl. furniture)	0.0529	0.0310
21	Paper and paper products	0.0217	-0.0085
22	Printing and publishing	0.0362	0.0273
23	Coke,refined petroleum products,nuclear fuel	0.0552	0.0588
24	Chemicals and chemical products	0.0388	0.0335
25	Rubber and plastics products	0.0453	0.0250
26	Non-metallic mineral products	0.0347	0.0254
27	Basic metals	0.0593	0.0205
28	Fabricated metal products	0.0461	0.0420
29	Machinery and equipment n.e.c.	0.0311	0.0258
30	Office, accounting and computing machinery	0.0205	-0.0187
31	Electrical machinery and apparatus	0.0178	0.0048
32	Radio,television and communication equipment	0.0437	0.0294
33	Medical, precision and optical instruments	0.0575	0.0593
34	Motor vehicles, trailers, semi-trailers	0.0415	0.0216
35	Other transport equipment	0.0623	0.0329
36	Furniture; manufacturing n.e.c.	0.0652	0.0183
37	Recycling	0.0854	0.1114

Notes: the figures for firm growth are calculated as simple averages for each industry across all countries over 1993-2007.

Table A.5: Average firm size across countries (emerging vs. advanced economies).

	ln(value added/ establisments)	ln(employment/ establisments)		ln(value added/ establisments)	ln(employment/ establisments)
Emerging economies			Advanced economies		
Argentina	13.0926	2.5649	Australia	13.8673	3.0748
Brazil	14.2997	4.0095	Austria	14.9068	3.7365
Chile	15.2133	4.5320	Belgium	14.4031	3.1381
China	14.3366	5.4955	Canada	15.3005	4.1100
Colombia	14.3206	4.1917	Denmark	14.2034	3.2051
Czech Rep.	12.3088	3.2204	Finland	14.1501	3.0860
Egypt	13.6256	5.1729	France	14.5447	3.5541
Estonia	12.7212	3.3806	Germany	15.1114	4.3555
Hungary	13.1038	3.4316	Greece	13.7871	3.1473
India	12.6239	4.1333	Iceland	12.6335	1.9650
Indonesia	14.1383	5.2593	Ireland	15.1298	3.9298
Malaysia	14.2651	4.4493	Israel	14.2278	3.6215
Mexico	15.6091	5.3758	Italy	13.6479	2.7297
Morocco	13.6435	4.1123	Japan	15.0237	3.4334
Peru	14.2768	4.9127	Korea	14.6598	3.5156
Philippines	14.2991	4.8483	Luxembourg	14.6073	3.5774
Poland	12.6314	2.8544	Netherlands	14.4978	3.2731
Russia	12.8178	4.1066	New Zealand	13.5543	2.5117
Slovak Rep.	14.0370	5.0359	Norway	14.6348	3.2547
Slovenia	13.1901	2.8816	Portugal	13.3098	3.0764
South Africa	13.6554	4.1059	Spain	13.8169	3.0201
Thailand	13.7794	4.3622	Sweden	14.1252	3.0312
Turkey	14.3480	3.9177	Switzerland	14.1766	2.9758
			UK	14.4581	3.4369
			US	15.8941	4.0708
Average	13.7538	4.1893	Average	14.3469	3.3132

Notes: the figures for firm size are calculated as simple averages for each country across all industries over 1993-2007.

Table A.6: Average firm size across industries (emerging vs. advanced economies)

Isic Sector	ln(value added/ establishments)		ln(employment/ establishments)	
	emerging	advanced	emerging	advanced
15 Food and beverages	13.6571	14.2212	4.0762	3.2552
16 Tobacco products	16.4653	17.7101	5.6752	5.2336
17 Textiles	13.3371	13.6278	4.4012	2.9523
18 Wearing apparel, fur	12.5968	12.6933	3.9360	2.2974
19 Leather, leather products and footwear	12.6838	13.0958	3.9945	2.7494
20 Wood products (excl. furniture)	12.3521	13.0941	3.3873	2.3365
21 Paper and paper products	14.1989	15.2075	4.3692	4.0063
22 Printing and publishing	12.9886	13.5260	3.3889	2.6130
23 Coke,refined petroleum products,nuclear fuel	16.7050	16.9162	5.3815	4.4898
24 Chemicals and chemical products	14.7125	15.7191	4.5065	4.0845
25 Rubber and plastics products	13.3845	14.3646	3.9281	3.4325
26 Non-metallic mineral products	13.6353	14.0763	3.9666	3.0253
27 Basic metals	14.9723	15.4979	4.9419	4.3097
28 Fabricated metal products	12.7606	13.3862	3.4705	2.5725
29 Machinery and equipment n.e.c.	13.3930	14.0770	4.0075	3.2050
30 Office, accounting and computing machinery	14.0410	14.2856	4.2008	3.2553
31 Electrical machinery and apparatus	13.9088	14.3519	4.3892	3.4835
32 Radio,television and comm. Equip.	14.3654	15.2370	4.5892	4.0851
33 Medical, precision and optical instruments	13.2087	13.9566	3.9528	2.9253
34 Motor vehicles, trailers, semi-trailers	14.7252	15.0444	4.8284	4.0148
35 Other transport equipment	13.9249	14.7947	4.4442	3.7953
36 Furniture; manufacturing n.e.c.	12.5031	12.8944	3.5616	2.2888
37 Recycling	11.9982	13.3798	3.1121	2.3024

Notes: the figures for firm size are calculated as simple averages for each sector across all countries over 1993-2007.

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