

Big Banks versus Small Banks: Good or Bad for Industries?

Job Market Paper

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January 2009

Abstract

I explore the effect of banking concentration and banking competition on the performance of manufacturing sectors. Theory offers ambiguous explanations regarding the effects of both banking concentration and banking competition on the size of manufacturing sectors and empirical studies using cross country data have not reached a consensus on these effects. I calculate a time series index of banking concentration for each country and using this index, I provide evidence that industries that rely more on external finance perform better in countries where there is a high level of banking concentration. I find the opposite result for banking competition.

JEL Codes: D4, G21, L11, L80, O16

Keywords: Banking, concentration, competition, value added, manufacturing sectors

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1 Introduction

There exists an extensive literature that emphasizes the importance of financial intermediaries for economic growth. Banking, as the most important among financial intermediaries, has received substantial attention in the literature. However, there are still conflicting theories and evidence about how the banking sector affects the size of the other industries. In the last two decades following the consolidation of banking systems, there has been a heated debate in academic and policy circles across the world about whether banking concentration and banking competition are more desirable for economic growth. In this paper, I provide new evidence on how banking concentration and banking competition affect the size of manufacturing industries in a panel of countries over time.

Previous work has used banking concentration as a measure of banking competition; however, I examine them separately, because they measure two different things. Banking concentration measures the share of the market that is controlled by the largest banks, but does not necessarily measure the competitive environment in the banking sector in a country. There are cases where a nearly competitive environment exists in markets with two or three banks, or where a substantially non-competitive environment has been observed in markets where there are thousands of suppliers, such as the credit card market (Shaffer, 2004).

I find that more concentration in the banking sector leads to higher levels of value added of the manufacturing sectors that are financially dependent on banks. The results are consistent with the previous finding that large banks lend a greater fraction of their assets than do the smaller banks, and that large banks focus more on business lending (DeYoung, Hunter, and Udell, 2004).

Using a measure of competitiveness, estimated as the sum of elasticities of revenue to input prices for individual banks, I find that banking competition does not have a positive effect on the value added of the manufacturing sectors that are dependent on external

finance, instead it may even harm these sectors. While unintuitive, the potential role of information in the relationship between banks and firms can rationalize such an outcome. Since monopolistic banks are better able to absorb high monitoring costs of firms, they can provide more credit to credit constrained opaque firms (Petersen and Rajan, 1995). Another possible interpretation of these results would be that an increase in banking competition causes banks to screen firms less rigorously, and lend more to “bad borrowers”. This may lead to an increase in interest rates and a decreased amount of credit made available to manufacturing sectors (Marquez, 2002).

There are two main innovations in this paper compared to the previous literature. The first innovation is the dynamic approach to banking concentration and banking competition. So far, the literature has looked at the effects of banking concentration and banking competition using only static measures of concentration and competition. However, market power in the banking industry keeps changing frequently (because of mergers and acquisitions of banks). The competitive environment also changes; new banks starting business, the existing ones offering new services such as internet banking, new transaction lending technologies.¹ My analysis uses panel data to estimate the effect of banking concentration and banking competition on the performance of manufacturing sectors as opposed to the pure cross-sectional approach of previous studies. A second innovation is using contemporary data for the banking sector and other manufacturing sectors. While previous studies have used cross section data from different points in time for manufacturing sectors and banking sector to estimate their relationships, I use matched data for all sectors. In a dynamic environment, using data from different points in time for different sectors will lead to biased estimates. My paper comes closer to identifying the true relationship.

To investigate the effect of bank concentration on the industries dependent on external

¹New transaction lending technologies include asset-based lending, leasing, and small business credit scoring.

finance, I adopt the methodological approach used by Cetorelli and Gambera (2001). In contrast to Cetorelli and Gambera (2001), to control for variation of bank concentration over time, I use five-year moving averages for bank concentration ratios, rather than an average concentration ratio of banks for the entire period. Under the assumption that increased credit provision does not have an immediate effect on the manufacturing sectors, I examine the influence of the last five years' annual banking concentration on manufacturing sectors performance, measured as the value added of the industry. In order to measure banking concentration, I use the five-bank concentration ratio and Herfindahl-Hirschman index.² Both concentration measures show consistent and positive effects of banking concentration on the performance of manufacturing sectors in need of external finance.

Using the same assumption that the effect of a change in competitive environment is not felt simultaneously and in the same magnitude at all manufacturing sectors, I build upon the strategy of Claessens and Laeven (2005) to estimate the effect of banking competition on the performance of manufacturing sectors. I estimate a competition index measured as the sum of the elasticities of bank revenue to input prices. Using panel data estimation, I find that more competition in the banking sector has a negative effect on manufacturing sectors value added, contrary to Claessens and Laeven (2005).

The rest of the paper is organized as follows. The very brief literature review is in section 2. Section 3 explains the theoretical framework of estimation of the concentration and competition indices in the banking sector. Data and their sources are described in section 4. In section 5, I describe the methodology used in the paper. Section 6 explains the empirical results, while robustness tests are explained in section 7 and section 8 concludes the paper.

²These concentration measures account for the share of the market that is controlled by the largest banks. The concentration measures are explained in detail in section 3 of the paper.

2 A Brief Review of Related Literature

The importance of the financial intermediaries for growth has not been established until at least the last two decades. In fact, Schumpeter (1911) argued that financial intermediaries are essential for technological innovation and economic development; however, for most of the last century financial development has been observed as being correlated with economic growth. One of the first studies that established a causality between financial development and growth is King and Levine (1993), which was followed by Levine and Zervos (1998) which argued that bank credit and growth are positively correlated.

Once it was established that bank credit is important for the economic growth, one of the following challenges in the economic literature is the importance of banking market structure and its effect on economic growth. The literature is far from consensus about the effect of bank concentration and bank competition on credit availability to firms, hence indirectly economic growth.

Rajan and Zingales (1998) put a cornerstone in the research about financial markets and growth. They find that industries in need of external finance grow faster in countries with more developed financial markets. They use U.S. firm level data to estimate the external financial dependence of different manufacturing sectors. Their basic assumption is that financial markets are well developed in the U.S., so the firms can borrow at the desired amount, which is determined only by the demand of the firm for external finance.³

One view suggests that markets with concentrated and less competitive banks are not growing at their best potential, since firms do not have access to credit, which leads to less growth, (Pagano, 1993 and Guzman, 2000). According to conventional wisdom, the increase of competition should warrant an expectation for lower prices on bank services, and greater

³The assumption that lies behind the usage of the same external finance dependence for each industry across the countries is that the external dependence is mainly due to technological reasons. This model does not assume that a sector in two countries depends on the external finance equally, it only assumes that ranking of the external finance dependence is similar across countries.

availability of credit, which would make it affordable for the small firms to borrow and invest more. Many empirical studies support this view, finding that higher concentration and more restrictions on competition lead to less new firm creation, and less economic growth (Berger, Hasan and Klapper, 2004, Cetorelli and Strahan, 2006). Allen and Gale (2000) find that an increase in bank market power leads to higher loan rates charged to borrowers, while Claessens and Laeven (2005) using a cross-section estimation method for bank competition, find that banking competition is important for the growth of industries dependent on external finance.

On the other side, banking concentration is found to have positive effects for economic growth. In a more concentrated banking system banks take on the role of information producers and exhibit a willingness to establish relationships with the clients. Due to asymmetric information between lenders and borrowers, less lending can occur so that investment also decreases as competition increases in the banking sector (Petersen and Rajan, 1995). Marquez (2002) suggests that an increase in banking competition causes banks to screen firms less rigorously, and charge a higher interest rate. This results in a decreased amount of credit made available to manufacturing sectors. Besides the theoretical studies, there are many empirical studies providing evidence that bank competition is detrimental to economic growth. In countries with less bank competition, the creation and emergence to the market of new firms is higher than in countries with high-levels of bank competition (Bonaccorsi di Patti and Dell' Ariccia, 2004 and Zarutskie, 2006). Cetorelli and Gambera (2001) find that industries in need of external finance grow faster in countries where there is more bank concentration.

To summarize, there has been no consensus about the effect of banking concentration and banking competition on the performance of industries dependent on external finance, and on economic growth of the country as a whole. This paper's advantage is that it employs a panel estimation method to account for time variation of bank concentration and

bank competition, and their effects on manufacturing industries. I find that more banking concentration helps the performance of industries dependent on external finance, and that bank competition is harmful to industries in need of external finance.

3 Theoretical Background on Concentration and Competition in Banking

3.1 Concentration

Different measures of concentration have been used to estimate the concentration ratio of the banking sector.⁴ In this paper, I focus on the two most commonly used measures of banking concentration: the k -bank concentration ratio and the Herfindahl-Hirschman Index. The k -bank concentration ratio is calculated by summing only over the market shares of k largest banks in the market:

$$CR_k = \sum_{i=1}^k s_i. \tag{1}$$

This index gives equal emphasis to the k leading banks, and neglects the rest of banks in the market. However, it is widely accepted that the big banks lead the market and shape it, therefore the role of the small banks is limited. There is no clear cut rule for how many banks should be included in this ratio. The cutoff number of the banks included in the ratio is often arbitrary, such as 3, 4, 5 or 10 of the biggest banks. This index varies between 0 and 1, where approaching zero means that the market has an infinite number of banks, while approaching one means that the banks included in this ratio own almost all of the market.

On the other hand, The Herfindahl-Hirschman Index (HHI) is a measure of the size and

⁴An extensive review of measures of competition and concentration in banking sector used in the literature can be found at Bikker and Haaf (2002)

the distribution of the banks in the market and it is commonly accepted as a measure of market concentration. The HHI is calculated by summing the squares of bank sizes measured as market shares.

$$HHI = \sum_{i=1}^n s_i^2. \quad (2)$$

The advantage of this index is that it does not neglect any bank, meaning that all the banks in the market are included. However, greater weight is given to the larger banks. The range of this index is $1/n$ and 1, where 1 means that there is only one bank that is monopoly. As the number of banks increases and the disparity of their shares of markets decreases, the index gets smaller in value. An increase in this index means an increase in the market power of the biggest banks.

3.2 Competition

In the last two decades, there has been a common understanding in the banking literature and the industrial organization literature, suggesting that banking concentration measures are problematic in measuring banking competition. Panzar and Rosse (1987) have developed a method to estimate a competition index (“ H -statistic”) using bank level data for revenues and factor input prices. This index is calculated as the sum of the elasticities of total revenue of banks to factor input prices, in a reduced form equation for bank revenues. A drawback of this model is that the banks should be in long run equilibrium in order to have a reasonable index (Nathan and Neave, 1989). However, there is a test to check for the validity of this assumption.⁵ The model assumes that price elasticity of demand is greater than unity.

⁵In the case of only short run equilibrium, the H statistic represents a one-tail test, that a positive value rejects any form of imperfect competition; however, we can have a negative value for different possibilities, including short-run competition (Shaffer, 1983).

The H -statistic is equal to the sum of elasticities of total revenue to factor input prices.

$$H = \sum_{j=1}^m (\partial R_i / \partial w_{ji}) * (w_{ji} / R_i), \quad (3)$$

where R represents the revenue of bank i , and w_j are the factor input prices of the bank.

An estimation of H -statistic can be provided by the following reduced form revenue equation:

$$\log R_{it} = \alpha + \sum_{j=1}^J \beta_j \log w_{ijt} + \sum_{k=1}^K \gamma_k \log X_{kit} + \sum_{m=1}^M \delta_m \log Z_{mt} + \epsilon_{it}, \quad (4)$$

where R is the revenue of bank i at year t ; w are the factor input prices of the bank; X are the bank specific variables that affect the bank's revenue and costs; Z are the macro variables that affect all the banks.

Using the $\hat{\beta}_j$ estimates I can calculate H -statistic. An $H < 0$ indicates that we have a monopoly in the market. In case of a monopoly, an increase in any of the input prices increases the marginal costs, which in turn reduces the equilibrium output and total revenue. On the other side an $H = 1$ only in the case of perfect competition. Under perfect competition, an increase in any of the input prices raises both marginal costs and revenues by the same amount. And finally, when $0 < H < 1$, we have monopolistic competition. Although an increase in the input prices would raise the revenues, the increase in revenue is somewhat less than the change in the costs.

4 Data

In this paper, I use firm (bank)-level, industry-level and country-level data. In this section, I explain their sources, characteristics and the way I estimated banking concentration

and banking competition indices.

4.1 Data on industries

Data on value added for each industry are obtained from Industrial Statistics Database (INDSTAT4 2008) which is collected by United Nations Industrial Development Organization (UNIDO). The industries are classified according to Revision 3 of the International Standard Industrial Classification of All Economic Activities (ISIC). The manufacturing sector data is arranged at 3 and 4 digits of ISIC codes, and include detailed information for 151 industries. The data is originally in national currency and current prices; however, I adjust them by deflating and converting all of them into U.S. dollars.

The external finance dependence data for each industry comes from Rajan and Zingales (1998). As explained in the literature review section, they use U.S. firm level data to estimate the external finance dependence of different manufacturing sectors. In order to use their external dependence data, I regroup the ISIC Rev.3 data into ISIC Rev 2. After I regroup the industries, I conduct the analysis using a mix of 3 and 4-digit ISIC industries which is the 36 industries in Rajan and Zingales (1998). The concordance table between the two revisions used to regroup the data is shown in appendix. Rajan and Zingales (1998) estimate two different external dependence indices for industries for the 1970's and 1980's. I use the average of these indices as the measure of external dependence.⁶

4.2 Data on countries

The data on the producer price index, and the exchange rate are obtained from International Financial Statistics (IFS) collected by International Monetary Fund (IMF). Producer

⁶The correlation of these indices is 0.63, which is high, and shows that external dependence of industries (not firms) does not change drastically. I used separately as dependence variables both the index of 1970's and that of 1980's and the results are very similar.

price index is used to deflate the value added data of the industrial sectors. I use the average period exchange rates to convert the data in other currencies into U.S. dollars.

Besides, I use two financial development indices: private credit by banks/GDP and stock market capitalization/GDP. I use the first one in the main regressions to control for financial development of the banks, and the second one in the robustness tests to control for the development of capital markets. The source of both of these variables is the dataset compiled by Beck, Demirguc-Kunt, and Levine (2000).⁷

4.3 Data on Banks

I use bank-level data to estimate bank concentration and bank competition indices. Bank-level data is obtained from BANKSCOPE, a comprehensive, global database that contains information on public and private banks. BANKSCOPE provides information on 28,000 banks around the world and covers years from 1987 to 2006. However, BANKSCOPE includes bank financial statements only for a couple of banks in a limited number of countries before 1994. Therefore, in this paper I restrict the empirical analysis to between 1994 and 2006.

I start with the whole sample of banks that are available in BANKSCOPE, which consists of 124,637 bank-year observations. This sample includes data for the whole period from 1987 to 2006, but dropping the data before 1994 reduces the sample only by 3359 bank-year observations.

BANKSCOPE contains financial statements for a whole group of financial institutions, such as: Bank Holding and Holding Companies, Central Banks, Commercial Banks, Cooperative Banks, Investment Banks/Securities Houses, Islamic Banks, Medium and Long Term

⁷The first version of this dataset and a paper explaining the methods how this dataset was compiled were published in 2000, however since then, the authors have updated their dataset many times. I am using the latest version, updated in November 2008.

Credit Banks, Multi-lateral Governmental Banks, Non-banking Credit Institutions, Real Estates / Mortgage Banks, Savings Banks, and Specialized Governmental Credit Institutions. To estimate banking concentration and banking competition measures, I use data only for commercial banks, savings banks and cooperative banks.⁸ BANKSCOPE provides consolidated and unconsolidated statements of the banks. I use consolidated statements where they are available, and otherwise use unconsolidated ones, in order to avoid double-counting.

4.3.1 Measuring Banking Concentration

I estimate the banking concentration using 5-bank concentration ratio and Herfindahl-Hirschman index.⁹ I estimate the concentration indices based on the share of assets of the banks. Using bank level data to estimate these concentration indices yearly captures a lot of noise, that is why I use the averages of 5 years as a measure for banking concentration. In this way, I create a time series of banking concentration index using rolling moving averages of 5 years.

BANKSCOPE data coverage has been in continuous improvement during the last 15 years, by increasing the number of covered countries, and the number of covered banks within each country. I drop the countries which have data available for less than 10 banks. I also drop countries that do not have data for at least 5 consecutive years, since I need to estimate an average of 5 years.

⁸The other institutions either are not regular banks that provide credit in return to interest rate to the private firms for investment, or are banks whose primary objective is not profit maximization. Including them in the bank concentration and/or bank competition estimation would spur the results, as their behavior is different due to several reasons.

⁹To prevent arbitrary decision about the cutoff number of the banks included in the concentration ratio, I have used 3-bank and 10-bank concentration ratios and I got similar results. I do not include them in paper, to prevent overwhelmed tables, however they are available upon request.

4.3.2 Measuring Banking Competition

As in the previous studies, I apply some selection criteria to the data before I estimate the banking competition. First of all, I drop the outliers for the main variables used in estimation of competition index (H -statistics), such as data on interest expense and personnel expense. I drop countries that have less than 10 observations per year and countries that have less than 50 bank observations in 5 consecutive years. For example, in order to estimate an H -statistic for the year 2000, I use the bank observations of the years 1996-2000 and estimate it only when I have observations for at least 10 banks per year, and 50 banks in the whole period. I run the OLS regressions with bank and time fixed effects to estimate the H -statistic.

$$\begin{aligned}\log(R_{it}) &= \alpha_i + \beta_1 \log(IE_{it}) + \beta_2 \log(PE_{it}) + \beta_3 \log(OE_{it}) \\ &\quad + \gamma_1 \log(EA_{it}) + \gamma_2 \log(LA_{it}) + \gamma_3 \log(A_{it}) \\ &\quad + \delta D_t + \epsilon_{it},\end{aligned}\tag{5}$$

where R_{it} is the ratio of gross interest revenue to total assets, which is proxy for the output price of loans; IE_{it} is the ratio of interest expenses to total deposits and money market funding, a proxy for input price of deposits; PE_{it} is the ratio of personnel expense to total assets, a proxy for input price of labor; and OE_{it} is the ratio of other operating and administrative expense to total assets which stands as a proxy for input price of equipment and fixed capital. EA_{it} is the ratio of equity to total assets, LA_{it} , is the ratio of net loans to total assets, and A_{it} is the total assets (to control for potential size effects). The subscript i denotes bank i , and the subscript t denotes year t and D is a vector of year dummies.

I run these regressions for all rolling 5 year periods starting at 1994 up to 2006. So I get a time series competition index measure with 9 years of observations.

5 Empirical Methodology

To investigate how banking concentration affects the performance in the other manufacturing sector I estimate the following model:

$$\begin{aligned}\log(\textit{ValueAdded}_{jct}) = & \alpha + \delta_1 \textit{Industry}_j + \delta_2 \textit{Country}_c + \delta_3 \textit{Time}_t + \delta_4 \textit{Country}_c * \textit{Time}_t \\ & + \beta_1 \textit{ExternalDependence}_j * \textit{FinancialDevelopment}_{ct} \\ & + \beta_2 \textit{ExternalDependence}_j * \textit{BankConcentrationIndex}_{ct} + \epsilon_{jct}\end{aligned}\tag{6}$$

where j indexes industries, c indexes countries and t indexes years. The dependent variable is the natural logarithm of value added of the manufacturing industries. I include country, industry and time fixed effects to isolate any specific and unobservable factor that might affect any specific country, industry and year. Besides, I have included an interaction of country and year dummies to control for other unobservable factors that affect the relationship between banking concentration and the level of value added of the manufacturing sectors. These dummies take account of unobservable factors, which are not measured on a yearly basis, and there is no panel data available for them.¹⁰

The first explanatory variable is an interaction of financial development index and external dependence of the industry, where financial development is measured as the ratio of Private Credit to GDP. I use the average of the last five years of the financial development index assuming that the level of value added of an industry is affected by the financial development of the country of the last five years. This variable determines whether the industries that need more external finance perform better in countries that are more financially developed. As in the previous studies, one would expect the sign of this variable to be positive.

¹⁰In the literature many factors are found to be important for the relationship between banks and manufacturing sectors such as: regulatory restrictions on competition, entry restrictions and legal impediments (La Porta, Lopez-de-Silanes, Shleifer, and Vishny, 1997, 1998), being privately or government-owned (La Porta, Lopez-de-Silanes, and Shleifer, 2002), and enforceability of financial contracts (Levine, 1999).

The last explanatory variable is the interaction of the external dependence of industries and the bank concentration index. The bank concentration index variable, as explained above, is the average of the last 5 years of bank concentration index. The reason I use 5 year rolling average of banking concentration is because an industry's investment and level of value added is affected due to conditions of access to credit in the last 5 years; i.e., how difficult it might be to get a loan, or what are the costs of getting a loan, or what are the conditions of the investment environment. This variable captures the effect of banking concentration depending on the external dependence of each manufacturing sector. The expected sign of this term is ambiguous, since there is no consensus as to whether banking concentration helps the industries that are in need of more external funding.

Besides, I use a similar estimation method, as explained above, but instead of using banking concentration index as an explanatory variable, I use the banking competition index. Although they have been used as the same measure in the previous literature, they can capture two different things. The estimation method I use is as follows:

$$\begin{aligned} \log(\text{ValueAdded}_{jct}) = & \alpha + \delta_1 \text{Industry}_j + \delta_2 \text{Country}_c + \delta_3 \text{Time}_t + \delta_4 \text{Country}_c * \text{Time}_t \\ & + \beta_1 \text{ExternalDependence}_j * \text{FinancialDevelopment}_{ct} \\ & + \beta_2 \text{ExternalDependence}_j * \text{BankCompetitionIndex}_{ct} + \epsilon_{jct}, \quad (7) \end{aligned}$$

where almost everything is similar to above, but the banking competition index. The banking competition index is estimated using the bank level data for the last five years, using Panzar-Rosse method. Since there is no consensus regarding whether banking competition helps the industries that depend more on external finance, one cannot expect which direction should be the sign of this variable.

In addition, I run the same regressions where I include both banking concentration and banking competition together.

$$\begin{aligned}
\log(\text{ValueAdded}_{jct}) = & \alpha + \delta_1 \text{Industry}_j + \delta_2 \text{Country}_c + \delta_3 \text{Time}_t + \delta_4 \text{Country}_c * \text{Time}_t \\
& + \beta_1 \text{ExternalDependence}_j * \text{FinancialDevelopment}_{ct} \\
& + \beta_2 \text{ExternalDependence}_j * \text{BankConcentrationIndex}_{ct} \\
& + \beta_3 \text{ExternalDependence}_j * \text{BankCompetitionIndex}_{ct} + \epsilon_{jct}, \quad (8)
\end{aligned}$$

If they are both measures of the banking competition, then due to collinearity, the coefficients would lose significance. However, if banking concentration and banking competition coefficients do not lose their significance that means that these two measures are not highly correlated and cannot be used as substitutes to measure banking competition.

6 Empirical Results

The regressions are performed for 36 countries, including OECD and some developing countries. I start out with more countries; however, upon merging data from three different sources and applying the selection criteria explained in the data section, I end up with a sample of 37 countries. Looking at the country list with available data, I drop Luxembourg, which is a very small and financially developed country.¹¹

¹¹I run the regressions including Luxembourg also, and get very similar results to the ones that are presented in the paper.

6.1 Regressions on Banking Concentration

The main results for the banking concentration are presented in Table 3. The main specification results for banking concentration are displayed at columns (2) and (4), respectively for 5-bank concentration ratio and Herfindal-Hirschman index. All the regressions include country, industry and time fixed effects, to account for unobservable factors which can affect the industries within a country, a specific industry in general, or all the countries at a specific year, respectively. In addition, I control for other unobservable factors that might effect the value added of industries that vary differently in each country every year, by including an interaction of country and year dummies.

Columns (1) and (2) show the results of regressions using 5-bank concentration ratio, while the columns (3) and (4) show the results of regressions using Herfindahl-Hirschman index. In columns (1) and (3), I show the results of the regression of value added of industries on the interaction variable between banking concentration index and external finance dependence of the industry and all fixed effects explained above, then I continue adding control variables to evaluate the impact of individual regressors.

In column(1), the interaction between 5-bank concentration ratio and external finance dependence has a positive coefficient and is statistically significant. A positive sign of this coefficient suggests that the industries that depend more on banks perform better in a country that has a concentrated banking system. Since the median external dependence of an industry is 0.15 and the coefficient of the interaction variable is about 0.9, an increase in banking concentration by 10 percent would result in an increase of log value added by 1.4 percent. In column (3), the interaction between HHI and external finance dependence has a coefficient three and a half times in magnitude as the 5-bank concentration ratio, which is expected, given that for the same change in the market structure, the change in HHI is smaller than the change in 5-bank concentration ratio.

In columns (2) and (4), I add an interaction variable between financial development index of the country and external dependence of the industry. The coefficient is positive and significant, which confirms that industries dependent on external finance perform better in the countries that are financially developed. After controlling for financial development of the country, and its effect on the industries based on external financial dependence of them, the effect of banking concentration remains positive and significant.

6.2 Regressions on Banking Competition

Table 4 displays the results of the regressions on banking competition. All the regressions include country, industry, year and interaction of country and year fixed effects. The main specification results are shown in column (2); however, I begin at column (1) only with the interaction of banking competition and external dependence of industries, the main variable of interest, and then add the other regressors.

In column (1), the interaction term of banking competition and external dependence of the industries has a negative and significant coefficient. This coefficient suggests that industries in need of external funds in a country that has experienced a huge competition between banks in the last 5 years perform worse than those that have been faced with relatively less competition in another country. Given that the median external dependence of the industries is 0.15, and the coefficient of the interaction term is about -1.58 , if bank competition rises by 10 percent, the value added of the industry that is externally dependent in the median would decrease by 2.4 percent.

Controlling for financial development in column (2), I provide evidence that financial development affects the performance of industries in need of external finance positively, as expected. The negative effect of banking competition is decreased slightly, but still an increase in competition index by 10 percent would result in a decrease of the value added of

the median externally dependent industry by 2.1 percent.

6.3 Using Banking Concentration and Banking Competition Together in a Regression

Table 5 shows the main results of the paper, where I include as independent regressors both banking competition index and banking concentration index. All the regressions include country, industry and time fixed effects, to account for unobservable factors which can affect the industries within a country, a specific industry in general, or all the countries at a specific year, respectively. In addition, I control for other unobservable factors that might effect the value added of industries that vary differently in each country every year, by including an interaction of country and year dummies.

While all regressions include banking competition index as a explanatory variable, I show the results of regressions using two different concentration measures. Columns (1) and (2) show the results of regressions using 5-bank concentration ratio, while the columns (3) and (4) show the results of regressions using Herfindahl-Hirschman index.

The coefficients of the explanatory variables in Table 5, are very similar to the coefficients of the same variables in the Tables 3 and 4, where banking competition and banking concentration are shown separately. The banking competition coefficient in columns (2) and (4) are -1.39 and -1.38 , which is very similar to the coefficient at Table 4 column (2), and it is significant at a level of 1 percent, also. This means that holding everything else constant, including the banking concentration constant, an increase of 10 percent in competition would decrease the value added of the median externally dependent industry by 2.1 percent. At the same time, holding everything else constant, an increase of 10 percent of the 5-bank concentration ratio would have a positive effect of 1.9 percent to the value added of industries that is externally dependent in the mean. Meanwhile, if the same percentage increase applies to

the banking concentration measured by Herfindal-Hirschman Index, the industry that has the mean external dependence would have a positive effect of 4.1 percent. Controlling for financial development, I find that there is a positive effect of financial development on the value added of the industries that need external finance. The coefficients of banking concentration and banking competition remain significant at the same level, and there is only a slight change in the level of the coefficients.

7 Robustness Tests

7.1 Omitted Variables

In this section, I control for some potentially omitted variables by controlling for industry level shocks in demand and/or supply for the output of the industries, and the development of capital markets.

7.1.1 Industry-level Changes

One can suggest that specific industries due to several different reasons might have a different path relative to the other industries. The reasons could vary from global demand or global supply shock for an industry's output, to technological changes that industries might face. For this reason, I include in my regressions an interaction term of industries and years. This interaction term can capture the variation that specific industries might have in specific years compared to the other industries and years.

Table 6 shows the results of regressions including an interaction variable of industries and years. The coefficients of the main variables of interest do not change in significance and are very similar to the ones in Tables 3 and 4.

7.1.2 Capital Market

Firms can borrow money outside of the banking system. Capital market is one of the preferred markets, especially for the large firms and mainly in the developed countries. One might suspect that value added of the industries is affected by other reasons, and banking concentration and banking competition captures only their effect. The primary suspect is the capital market, as many large firms borrow in capital markets. For this reason, I check the robustness of my regressions by controlling for the development of capital markets. I use as a measure the ratio of stock market capitalization to GDP. I use data from Beck, Demirgüç-Kunt and Levine (2000, the updated 2008 version). I control for the effect of the stock market development to different industries. Table 7 shows the results of the regressions including the development of capital market. The coefficient of interaction of capital market development and external dependence of industries is highly significant and positive showing that capital market development has an additional positive effect on the industries that need external funds. Meanwhile, the coefficients of the interaction of external dependence of industries and banking competition and banking concentration (HHI index) remain significant at the same level of significance. Only the coefficient of interaction of external dependence of industries and banking concentration measured as largest 5 bank concentration ratio loses significance, but it still remains positive.

Given these results, one can conclude that even after controlling for the development of capital markets the effects of banking concentration and banking competition remain significant.

7.2 Testing on Mature Firms

In the main regressions, the measure that I use as the external dependence of the industries is estimated for all firms in a specific industry. However, firms of different ages do

not need the same amount of external funds. Young firms generally need more funds than they can raise themselves, while mature firms can generally finance themselves and are not in need for external funds. To check the robustness of my results, I run the regressions using the external dependence for mature firms. I use the external dependence of industries from Rajan and Zingales as they estimate the external finance dependence of industries, for all firms, young firms, and old firms, separately (with old firms being those which have been operating for at least 10 years).

While in main regression the external dependence of industries using data for all firms was the average of 1970's and 1980's, the external financial dependence data for mature firms is available only for the 1980's. The results are displayed in Table 8, where it can be observed that all the coefficients remain significant. Even with different external dependence measure, I find that banking concentration has a positive effect on the value added of the manufacturing sectors that are in need of external funds, while the banking competition has a negative effect.

7.3 Investment Opportunities instead of External Finance

The external finance dependence measure developed first by Rajan and Zingales, has been adopted in many papers to examine different factors why industries grow faster in some countries than in others (e.g. among others Cetorelli and Gambera, 2001; Fisman and Love, 2003; Claessens and Laeven, 2005).

Meanwhile, there have been offered some alternative measures to external finance dependence such as growth opportunities measure from Fisman and Love (2004), which is proxied by the sales growth rate of industries in United States. Ciccone and Papaioannou (2006) offers another measure which they name it investment opportunities. They measure investment opportunities using as a proxy the growth rate of capital in each industry in US. I

adopt their measure and use in my regressions. Instead of using an interaction of banking concentration/banking competition and external finance dependence, I use an interaction of banking concentration/banking competition and investment opportunities.¹²

The results of these regressions are shown in Table 9. The coefficients are high, since the average value of investment opportunities is really low in magnitude, with a median 0.01 and a mean of 0.011. An increase of 10 percent in banking concentration measured as concentration ratio of the largest five banks generates an increase of 1.6 percent in the value added of the median industry for investment opportunities. The same increase in the banking concentration measured with Herfindahl-Hirschman Index would create an increase of 3.5 percent to the median industry in investment opportunities. On the other hand, an increase in banking competition by 10 percent would decrease the value added of the median industry by 1.13 percent. All these coefficients are statistically significant at 1 percent.

Although, external financial dependence and investment opportunities measures do not measure the same concept, the interpretation of the coefficient is almost the same. An increase of banking concentration/banking competition would have almost the same effect in the respective median industries.

7.4 Accounting for Initial Value

To check the robustness of results, I rerun the regressions controlling for the lagged value of value added of manufacturing sectors. In this way, I can control for the growth of manufacturing sectors. I add as a regressor the 5 year lag of the value added of manufacturing sectors, which is the value added of them at the beginning of the period that I take into consideration when I use the moving average of banking concentration and banking competition. In my regressions the value added of manufacturing sectors is explained by an

¹²In order to use their investment opportunities measure, I need to regroup the industries, since they do not use exactly the same grouping as Rajan and Zingales (1998). I regroup the industries from 36 industries in the original regressions, into 28 industries as in Ciccone and Pappaioannou (2006).

interaction term of banking concentration/banking competition of the last five years and external dependence of industries, an interaction term of financial development of the last five years and external dependence of industries, and the value added of the industry five years ago, which is the initial value added of the period.

In Table 10, I show the results of the regressions that account for initial value of the dependent variable. The positive effect of banking concentration to the value added of externally dependent manufacturing sectors remains significant and comparable to the previous estimations. Meanwhile, the coefficient of the interaction of banking competition and external dependence loses its significance, however it remains negative.

8 Conclusion

This paper assesses the impact of bank concentration and bank competition on the size of value added of manufacturing industries that are dependent on external finance. An important innovation of this paper is the utilization of panel data to control for time variation of bank concentration and bank competition. While in the literature, bank concentration and bank competition have been used interchangeably, in this paper I examine them separately.

By using bank concentration index as a measure of the share of the market pertaining to the largest banks, I measure whether the market is dominated by large banks. This paper provides evidence that, in markets where banking concentration is higher, industries in need of external funds perform better.

Furthermore, I use a competition index, which is estimated as the sum of the elasticities of total revenue of banks to factor input prices using a reduced form equation for bank revenues. The results suggest that bank competition is harmful to the performance of industries in need of external funds. These results support theories that monopolistic banks are better at providing credit to opaque firms (Petersen and Rajan, 1995), and that an increase in

banking competition leads to a decreased amount of credit available to manufacturing sectors (Marquez, 2002).

The results are robust to the control for various external dependence measurements, or other factors that might affect the relationship between bank concentration and bank competition to the performance of industries in need of external funds. In conclusion, this paper supports the view that market power is good for the access to financing and that banking competition is harmful to the output of the industries dependent on external finance.

References

- [1] Allen, Franklin, and Douglas Gale (2000) Comparing Financial Systems, Cambridge, MA and London: MIT Press.
- [2] Beck, Thorsten, Asli Demirgüç-Kunt, and Ross Levine (2000) “A New Database on Financial Development and Structure,” World Bank Economic Review 14, 597-605.
- [3] Berger, Allen N., Iftekar Hasan, and Leora F. Klapper (2004) “Further Evidence on the Link Between Finance and Growth: An International Analysis of Community Banking and Economic Performance,” Journal of Financial Services Research 25, 169-202.
- [4] Bikker, Jacob A., and Katharina Haaf (2002) “Measures of Competition and Concentration in the Banking Industry: A Review of the Literature,” Economic and Financial Modelling 9, 53-98.
- [5] Bonaccorsi di Patti, Emilia, and Giovanni Dell’Ariccia (2004) “Bank Competition and Firm Creation,” Journal of Money, Credit, and Banking 36, 225-252.
- [6] Cetorelli, Nicola, and Michele Gambera (2001) “Bank Structure, Financial Dependence and Growth: International Evidence from Industry Data,” Journal of Finance 56, 617-648.
- [7] Cetorelli, Nicola, and Philip E. Strahan (2006) “Finance as a Barrier to Entry: Bank Competition and Industry Structure in Local U.S. Markets,” Journal of Finance 61, 437-461.
- [8] Ciccone, Antonio and Elias Papaioannou (2006) “Adjustment to Target Capital, Finance, and Growth,” CEPR Discussion Paper 5969.

- [9] Claessens, Stijn, Asli Demirguc-Kunt, and Harry Huizinga (2001) “How Does Foreign Entry Affect the Domestic Banking Market?” Journal of Banking and Finance 25, 891-911.
- [10] Claessens, Stijn, and Luc Laeven(2005) “Financial Dependence, Banking Sector Competition, and Economic Growth,” Journal of the European Economic Association 3, 179-207.
- [11] Demirguc-Kunt, Asli, and Ross Levine (2001) “Bank-Based and Market-Based Financial Systems: Cross-Country Comparisons” in Financial Structure and Economic Growth: A Cross-Country Comparison of Banks, Markets, and Development, Eds: Asli Demirguc-Kunt and Ross Levine. Cambridge, MA: MIT Press.
- [12] DeYoung, Robert, William C. Hunter, and Gregory F. Udell (2004) “The Past, Present and Future for Community Banks,” Journal of Financial Services Research 25, 85-133.
- [13] Fisman, Raymond, and Inessa Love (2003) “Trade Credit, Financial Intermediary Development, and Industry Growth,” Journal of Finance 58(1), 353-374.
- [14] Fisman, Raymond, and Inessa Love (2004) “Financial Development and Intersectoral Allocation: A New Approach,” Journal of Finance 59(6), 2785-2808.
- [15] Guzman, Mark G. (2000) “Research Articles : Bank Structure, Capital Accumulation and Growth: A Simple Macroeconomic model,” Economic Theory 16(2), 421-455.
- [16] King, Robert G., and Ross Levine (1993) “Finance and Growth: Schumpeter Might Be Right,” Quarterly Journal of Economics 108, 717-738.
- [17] La Porta, Rafael, Florencio Lopez-de-Silanes, Andrei Shleifer, and Robert W. Vishny (1997) “Legal Determinants of External Finance,” Journal of Finance 52, 1131-1150.

- [18] La Porta, Rafael, Florencio Lopez-de-Silanes, Andrei Shleifer, and Robert W. Vishny (1998) “Law and Finance,” Journal of Political Economy 106, 1113-1155.
- [19] La Porta, Rafael, Florencio Lopez-de-Silanes, and Andrei Shleifer (2002) “Government Ownership of Banks,” Journal of Finance 57, 265-301.
- [20] Levine, Ross (1999) “Law, Finance and Economic Growth,” Journal of Financial Intermediation 8, 8-35.
- [21] Levine, Ross, and Sara Zervos (1998) “Stock Markets, Banks, and Economic Growth,” American Economic Review 88, 537-558.
- [22] Marquez, Robert(2002) “Competition, Adverse Selection, and Information Dispersion in the Banking Industry,” Review of Financial Studies 15, 901-926.
- [23] Nathan, Alli, and Edwin H. Neave (1989) “Competition and Contestability in Canada’s Financial System: Empirical Results,” Canadian Journal of Economics 22, 576-594.
- [24] Pagano, Marco (1993) “Financial Markets and Growth: An Overview,” European Economic Review 37, 613-622.
- [25] Panzar, John C., and James N. Rosse(1987) “Testing for ‘Monopoly’ Equilibrium,” Journal of Industrial Economics 35, 443-456.
- [26] Petersen, Mitchell A., and Raghuram G. Rajan(1995) “The Effect of Credit Market Competition on Lending Relationship,” Quarterly Journal of Economics 110, 407-443.
- [27] Rajan, Raghuram G., and Luigi Zingales (1998) “Financial Dependence and Growth,” The American Economic Review 88, 559-586.
- [28] Shaffer, Sherrill (1983) “Non-structural measures of competition: Toward a Synthesis of Alternatives,” Economic Letters 12, 349-353.

- [29] Shaffer, Sherrill (2004) “Comment on ‘What Drives Bank Competition? Some International Evidence,’” Journal of Money, Credit, and Banking 36(3), 585-592.
- [30] Schumpeter, Joseph A. (1911) The Theory of Economic Development, Cambridge, MA: Harvard University Press.
- [31] Zarutskie, Rebecca (2006) “Evidence on the effects of bank competition on firm borrowing and investment,” Journal of Financial Economics 81, 503-537.

Table 1: Descriptive Statistics

| Variable | Observations | Mean | Std. Dev. | Min | Max |
|---------------------------------|--------------|-------|-----------|-------|-------|
| Log of value added of industry | 5321 | 20.54 | 2.08 | 9.86 | 26.08 |
| 5-Bank concentration ratio | 5321 | 0.69 | 0.15 | 0.39 | 0.97 |
| Herfindahl-Hirschman Index | 5321 | 0.16 | 0.09 | 0.04 | 0.62 |
| Competition index | 5327 | 0.63 | 0.23 | -0.39 | 1.11 |
| External financial dependence | 5321 | 0.20 | 0.25 | -0.30 | 0.80 |
| Private Credit/GDP | 5321 | 0.70 | 0.44 | 0.07 | 1.99 |
| Stock Market Capitalization/GDP | 5321 | 0.56 | 0.49 | 0.01 | 2.60 |

Notes: This table reports the descriptive statistics of the main regressions. Value added data is from Industrial Statistics Database (INDSTAT 2008) collected by UNIDO and it is classified by ISIC. External financial dependence is measured as the gap between investment and cash flows in each industry; its source is Rajan and Zingales (1998). 5-bank concentration ratio index, Herfindahl-Hirschman Index and Competition index are author's estimations using the methods explained in detail in data section. The bank-level data used to estimate these indices are from Bankscope. Private Credit/GDP and Stock Market Capitalization/GDP are from Beck, Demirguc-Kunt and Levine(2000).

Table 2: Correlation Matrix of Regression Variables

| | VA | CR5 | HHI | Comp | Ext.Dep. | Priv.Credit/ GDP | Stock Mkt Cap/ GDP |
|--------------------|-------|------|------|-------|----------|---------------------|-----------------------|
| Log of value added | 1 | | | | | | |
| 5-Bank conc ratio | -0.31 | 1 | | | | | |
| HHI | -0.19 | 0.80 | 1 | | | | |
| Competition index | -0.20 | 0.15 | 0.08 | 1 | | | |
| Ext. fn. dep. | 0.05 | 0.02 | 0.03 | -0.01 | 1 | | |
| Priv.Credit/GDP | 0.38 | 0.03 | 0.02 | -0.09 | 0.02 | 1 | |
| Stock Mkt Cap/GDP | 0.27 | 0.33 | 0.33 | -0.05 | 0.02 | 0.62 | 1 |

Notes: This table reports the descriptive statistics of the main regressions. Value added data is from Industrial Statistics Database (INDSTAT 2008) collected by UNIDO and it is classified by ISIC. 5-bank concentration ratio index, Herfindahl-Hirschman Index and Competition index are author's estimations using the methods explained in detail in data section. The bank-level data used to estimate these indices are obtained from Bankscope. External financial dependence is measured as the gap between investment and cash flows in each industry; its source is Rajan and Zingales (1998). Private Credit/GDP and Stock Market Capitalization/GDP are from Beck, Demirguc-Kunt and Levine(2000).

Table 3: OLS Regressions: Banking Concentration

| | Dependent variable: Log of value added of industries | | | | | |
|---|--|----------------------------|-------------------|--------------------|-----|-----|
| | 5-Bank Concentration Ratio | Herfindahl-Hirschman Index | (1) | (2) | (3) | (4) |
| Interaction(external dependence* *bank concentration) | 0.90* (1.91) | 1.06** (2.39) | 3.20*** (4.86) | 3.69*** (5.82) | | |
| Interaction(external dependence* *financial development of the period) | | 1.83*** (14.68) | | 1.85*** (14.94) | | |
| Partial R-square | 0.001 | 0.008 | 0.001 | 0.009 | | |
| Observations | 5321 | 5321 | 5321 | 5321 | | |

Notes: Heteroscedasticity robust t-statistics in parentheses. Dependent variable is natural log of value added of manufacturing industries. Bank concentration ratio is estimated as average of last five years bank concentration index. Columns (1) and (2) display the results of regressions using 5-bank concentration ratio index, while columns (3) and (4) display the results of regressions using Herfindahl-Hirschman Index. External dependence is the fraction of capital expenditures financed with external funds for each industry. I use the average of external dependence for 1970's and 1980's from Rajan and Zingales (1998). Financial development indicator is the average of the last five years of the ratio of private credit to GDP. All regressions include country, industry, year and interaction of country and year fixed effects. *, **, *** stand for 10, 5 and 1 percent significance respectively.

Table 4: OLS Regressions: Banking Competition

Dependent variable: Log of value added of industries

| | (1) | (2) |
|---|--------------------|---------------------|
| Interaction(external dependence* *bank competition) | -1.58** (-5.58) | -1.40*** (-5.19) |
| Interaction(external dependence* *financial development of the period) | | 1.68*** (13.92) |
| Partial R-square | 0.002 | 0.008 |
| Observations | 5327 | 5327 |

Notes: Heteroscedasticity robust t-statistics in parentheses. Dependent variable is natural log of value added of manufacturing industries. Bank competition is estimated using Panzar-Rosse (1987) method. The index is calculated as the sum of the elasticities of total revenue of banks to factor input prices using a reduced form equation for bank revenues for the last 5 years. External dependence is the fraction of capital expenditures financed with external funds for each industry. I use the average of external dependence for 1970's and 1980's from Rajan and Zingales (1998). Financial development indicator is the average of the last five years of the ratio of private credit to GDP. All regressions include country, industry, year and interaction of country and year fixed effects. *, **, *** stand for 10, 5 and 1 percent significance respectively.

Table 5: OLS Regressions: Banking Concentration and Competition

| | Dependent variable: Log of value added of industries | | | |
|---|--|---------------------|----------------------------|---------------------|
| | 5-Bank Concentration Ratio | | Herfindahl-Hirschman Index | |
| | (1) | (2) | (3) | (4) |
| Interaction(external dependence* *bank concentration) | 1.14** (2.48) | 1.23*** (2.80) | 3.69*** (5.66) | 4.13*** (6.54) |
| Interaction(external dependence* *bank competition) | -1.78*** (-5.16) | -1.39*** (-4.20) | -1.78*** (-5.14) | -1.38*** (-4.17) |
| Interaction(external dependence* *financial development of the period) | | 1.74*** (14.18) | | 1.77*** (14.41) |
| Partial R-square | 0.002 | 0.009 | 0.003 | 0.01 |
| Observations | 5015 | 5015 | 5015 | 5015 |

Notes: Heteroscedasticity robust t-statistics in parentheses. Dependent variable is natural log of value added of manufacturing industries. Bank concentration ratio is estimated as average of last five years bank concentration index. Columns (1) and (2) display the results of regressions using 5-bank concentration ratio index, while columns (3) and (4) display the results of regressions using Herfindahl-Hirschman Index. Bank competition is estimated using Panzar-Rosse (1987) method. The index is calculated as the sum of the elasticities of total revenue of banks to factor input prices using a reduced form equation for bank revenues for the last 5 years. External dependence is the fraction of capital expenditures financed with external funds for each industry. I use the average of external dependence for 1970's and 1980's from Rajan and Zingales (1998). Financial development indicator is the average of the last five years of the ratio of private credit to GDP. All regressions include country, industry, year and interaction of country and year fixed effects. *, **, *** stand for 10, 5 and 1 percent significance respectively.

Table 6: Controlling for Industry Level Changes

Dependent variable: Log of value added of industries

| | (1) | (2) | (3) |
|---|--------------------|--------------------|---------------------|
| Interaction(external dependence* *bank concentration CR 5 banks) | 1.04*** (2.33) | | |
| Interaction(external dependence* *bank concentration HHI) | | 3.61*** (5.40) | |
| Interaction(external dependence* *bank competition) | | | -1.41*** (-5.12) |
| Interaction(external dependence* *financial development of the period) | 1.82*** (14.56) | 1.85*** (14.86) | 1.69*** (13.88) |
| Partial R-square | 0.008 | 0.009 | 0.008 |
| Observations | 5321 | 5321 | 5327 |

Notes: To control for any changes that specific industries might have in different years, I include in all regressions an interaction of industry and year fixed effects. Heteroscedasticity robust t-statistics in parentheses. Dependent variable is natural log of value added of manufacturing industries. Bank concentration ratio is estimated as average of last five years bank concentration index. Columns (1) and (2) display the results of regressions using 5-bank concentration ratio index, while columns (3) and (4) display the results of regressions using Herfindahl-Hirschman Index. Bank competition is estimated using Panzar-Rosse (1987) method. The index is calculated as the sum of the elasticities of total revenue of banks to factor input prices using a reduced form equation for bank revenues for the last 5 years. External dependence is the fraction of capital expenditures financed with external funds for each industry. I use the average of external dependence for 1970's and 1980's from Rajan and Zingales (1998). Financial development indicator is the average of the last five years of the ratio of private credit to GDP. All regressions include country, industry, year and interaction of country and year fixed effects. *, **, *** stand for 10, 5 and 1 percent significance respectively.

Table 7: Stock Market Capitalization

| Dependent variable: Log of value added of industries | | | |
|---|-------------------|-------------------|---------------------|
| | (1) | (2) | (3) |
| Interaction(external dependence* *bank concentration CR 5 banks) | 0.09 (0.19) | | |
| Interaction(external dependence* *bank concentration HHI) | | 2.36*** (3.35) | |
| Interaction(external dependence* *bank competition) | | | -1.36*** (-5.15) |
| Interaction(external dependence* *financial development of the period) | 1.04*** (6.37) | 1.19*** (7.08) | 0.86*** (5.64) |
| Interaction(external dependence* *stock market capitalization/GDP) | 1.20*** (6.31) | 1.01*** (5.25) | 1.33*** (7.49) |
| Partial R-square | 0.010 | 0.011 | 0.011 |
| Observations | 5294 | 5294 | 5327 |

Notes: Heteroscedasticity robust t-statistics in parentheses. Dependent variable is natural log of value added of manufacturing industries. Bank concentration ratio is estimated as average of last five years bank concentration index. Columns (1) and (2) display the results of regressions using 5-bank concentration ratio index, while columns (3) and (4) display the results of regressions using Herfindahl-Hirschman Index. Bank competition is estimated using Panzar-Rosse (1987) method. The index is calculated as the sum of the elasticities of total revenue of banks to factor input prices using a reduced form equation for bank revenues for the last 5 years. External dependence is the fraction of capital expenditures financed with external funds for each industry. I use the average of external dependence for 1970's and 1980's from Rajan and Zingales (1998). Financial development indicator is the average of the last five years of the ratio of private credit to GDP. Private Credit/GDP and Stock Market Capitalization/GDP are from Beck, Demirguc-Kunt and Levine(2000). All regressions include country, industry, year and interaction of country and year fixed effects. *, **, *** stand for 10, 5 and 1 percent significance respectively.

Table 8: External Financial Dependence of Mature Firms

| Dependent variable: Log of value added of industries | | | |
|---|--------------------|--------------------|---------------------|
| | (1) | (2) | (3) |
| Interaction(external dependence* *bank concentration CR 5 banks) | 2.05*** (6.36) | | |
| Interaction(external dependence* *bank concentration HHI) | | 4.53*** (8.34) | |
| Interaction(external dependence* *bank competition) | | | -0.77*** (-3.60) |
| Interaction(external dependence* *financial development of the period) | 1.00*** (10.25) | 1.04*** (10.64) | 0.95*** (9.33) |
| Partial R-square | 0.005 | 0.006 | 0.004 |
| Observations | 5321 | 5321 | 5327 |

Notes: Heteroscedasticity robust t-statistics in parentheses. Dependent variable is natural log of value added of manufacturing industries. Bank concentration ratio is estimated as average of last five years bank concentration index. Columns (1) and (2) display the results of regressions using 5-bank concentration ratio index, while columns (3) and (4) display the results of regressions using Herfindahl-Hirschman Index. Bank competition is estimated using Panzar-Rosse (1987) method. The index is calculated as the sum of the elasticities of total revenue of banks to factor input prices using a reduced form equation for bank revenues for the last 5 years. External dependence is the fraction of capital expenditures financed with external funds for each industry. I use the external dependence for mature firms in 1980's from Rajan and Zingales (1998). Financial development indicator is the average of the last five years of the ratio of private credit to GDP. All regressions include country, industry, year and interaction of country and year fixed effects. *, **, *** stand for 10, 5 and 1 percent significance respectively.

Table 9: Investment Opportunity instead of External Finance

| Dependent variable: Log of value added of industries | | | |
|--|--------------------|--------------------|----------------------|
| | (1) | (2) | (3) |
| Interaction(investment opportunity* *bank concentration CR 5 banks) | 15.99*** (3.59) | | |
| Interaction(investment opportunity* *bank concentration HHI) | | 35.09*** (5.36) | |
| Interaction(investment opportunity* *bank competition) | | | -11.26*** (-3.87) |
| Interaction(investment opportunity* *financial development of the period) | 14.04*** (9.91) | 13.91*** (9.88) | 13.21*** (9.36) |
| Partial R-square | 0.005 | 0.006 | 0.005 |
| Observations | 4399 | 4399 | 4405 |

Notes: Heteroscedasticity robust t-statistics in parentheses. Dependent variable is natural log of value added of manufacturing industries. Bank concentration ratio is estimated as average of last five years bank concentration index. Columns (1) and (2) display the results of regressions using 5-bank concentration ratio index, while columns (3) and (4) display the results of regressions using Herfindahl-Hirschman Index. Bank competition is estimated using Panzar-Rosse (1987) method. The index is calculated as the sum of the elasticities of total revenue of banks to factor input prices using a reduced form equation for bank revenues for the last 5 years. External dependence is the fraction of capital expenditures financed with external funds for each industry. Instead of external dependence measure I use investment opportunity measure from Ciccone and Papaioannou (2006). Financial development indicator is the average of the last five years of the ratio of private credit to GDP. All regressions include country, industry, year and interaction of country and year fixed effects. *, **, *** stand for 10, 5 and 1 percent significance respectively.

Table 10: Accounting for initial value

| Dependent variable: Log of value added of industries | | | |
|---|--------------------|--------------------|--------------------|
| | (1) | (2) | (3) |
| Interaction(external dependence* *bank concentration CR 5 banks) | 1.12*** (5.40) | | |
| Interaction(external dependence* *bank concentration HHI) | | 1.87*** (5.45) | |
| Interaction(external dependence* *bank competition) | | | -0.13 (-0.79) |
| Interaction(external dependence* *initial fin development of the period) | 0.05 (0.59) | 0.04 (0.55) | 0.04 (0.47) |
| 5-year lag of value added | 0.88*** (60.34) | 0.88*** (60.17) | 0.88*** (58.50) |
| Partial R-square | 0.12 | 0.12 | 0.12 |
| Observations | 3980 | 3980 | 3880 |

Notes: Heteroscedasticity robust t-statistics in parentheses. Dependent variable is natural log of value added of manufacturing industries. External dependence is the fraction of capital expenditures financed with external funds for each industry. I use the external dependence for young firms in 1980's from Rajan and Zingales (1998). Bank competition is estimated using Panzar-Rosse (1987) method. The index is calculated as the sum of the elasticities of total revenue of banks to factor input prices using a reduced form equation for bank revenues for the last 5 years. Financial development indicator is the ratio of private credit to GDP. 5-year lag of value added is the lagged value of natural log of manufacturing sectors' value added. All regressions include country, industry and year fixed effects. *, **, *** stand for 10, 5 and 1 percent significance respectively.

Appendices

A Concordance table of ISIC Rev. 2 and ISIC Rev. 3

| Industrial sector | ISIC Rev. 2 | ISIC Rev. 3 |
|-----------------------------|-------------|------------------------------------|
| Food products | 311 | 151, 152, 153, 154 |
| Beverages | 313 | 155 |
| Tobacco | 314 | 16 |
| Textile | 321 | 17 |
| Apparel | 322 | 18 |
| Leather | 323 | 191 |
| Footwear | 324 | 192 |
| Wood products | 331 | 20 |
| Furniture | 332 | 361 |
| Paper and products | 341 | 21 |
| Printing and publishing | 342 | 22 |
| Other chemicals | 352 | 24 |
| Petroleum refineries | 353 | 23 |
| Rubber products | 355 | 251 |
| Plastic products | 356 | 252 |
| Pottery | 361 | 2691 |
| Glass | 362 | 2610 |
| Nonmetal products | 369 | 2692, 2693, 2694, 2695, 2696, 2699 |
| Iron and steel | 371 | 2710, 2731 |
| Nonferrous metal | 372 | 2720, 2732 |
| Metal products | 381 | 28 |
| Machinery | 382 | 29 |
| Electric machinery | 383 | 31, 32 |
| Transportation equipment | 384 | 35 |
| Professional goods | 385 | 33 |
| Other industries | 390 | 369 |
| Pulp, paper | 3411 | 2101 |
| Basic excluding fertilizers | 3511 | 2411 |
| Synthetic resins | 3513 | 2413, 2430 |

continued on next page

| Industrial sector | ISIC Rev. 2 | ISIC Rev. 3 |
|----------------------|-------------|-------------|
| Drugs | 3522 | 2423 |
| Office and computing | 3825 | 30 |
| Radio | 3832 | 3220, 3230 |
| Ship | 3841 | 3511, 3512 |
| Motor vehicle | 3843 | 34 |

B List of the countries included in regressions

The list of the countries that are used in regressions includes only 36 countries. I start out with many countries, however due to merging of the data from three sources such as UNIDO data (INDSTAT4 2008), BANKSCOPE and International Financial Statistics (IFS) and the applying of selection criteria, I end up with the following list of the countries:

Argentina, Australia, Austria, Belgium, Brazil, Bulgaria, Canada, Cyprus, Czech Republic, Denmark, France, Germany, Hungary, India, Italy, Japan, Kenya, Latvia, Netherlands, Norway, Panama, Peru, Philippines, Poland, Portugal, Republic of Korea, Romania, Singapore, Slovakia, South Africa, Spain, Sweden, Switzerland, Turkey, United Kingdom, Uruguay.