

Financial Dependence, Banking Sector Competition, and Economic Growth

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Abstract: The relationships among competition in the financial sector, access of firms to external financing, and associated economic growth are ambiguous in theory. Moreover, measuring competition in the financial sector can be complex. In this paper we first estimate for 16 countries a measure of banking system competition based on industrial organization theory. We then relate this competition measure to growth of industries and find that greater competition in countries' banking systems allows financially dependent industries to grow faster. These results are robust under a variety of tests. Our results suggest that the degree of competition is an important aspect of financial sector functioning.

Keywords: Banking, competition, contestability, economic growth

JEL classification codes: D4, G21, L11, L80, O16

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1. INTRODUCTION

Recently, a large number of papers have established that greater financial development fosters growth and that financial development is related to a country's institutional characteristics, including its legal framework (the literature is reviewed in Levine 2004). The financial development and growth literature has established that finance matters for growth both at the macroeconomic and microeconomic levels (King and Levine 1993). The law and finance literature has found that financial markets are better developed in countries with strong legal frameworks (La Porta et al. 1998; Beck et al. 2003). Well-developed financial markets in turn make it easier for firms to attract financing for their investment needs (Rajan and Zingales 1998).

Thus far this literature has not paid much attention to competition in the financial sector, although such competition matters for a number of reasons. As in other industries, the degree of competition in the financial sector can affect the efficiency of the production of services, the quality of products, and the degree of innovation in that sector. Specific to the financial sector is the link between competition and stability that has long been recognized in theoretical and empirical research (see Allen and Gale (2004) for a review) and, most importantly, in the actual conduct of prudential policy toward banks. Also important, it has been shown theoretically that the degree of competition in the financial sector can affect the access of firms to external financing (see Vives (2001) for a review). The direction of this relationship, however, is unclear. Less competitive systems may lead to easier access to external financing because, with more market power, banks are more inclined to invest in information acquisition and relationships with borrowers. However, when banking systems are less competitive, hold-up problems may lead

borrowers to be less willing to enter such relationships, thereby lowering the effective demand for external financing. Furthermore, less-competitive banking systems can be more costly and exhibit a lower quality of services, thereby lowering the effective demand for external financing and thus encouraging less growth. These effects may further vary by the degree of competition in the country's overall financial sector; for example, the degree of hold-up problems in the system may vary with the availability of financing options outside of the banking system (e.g., from capital markets).

Although some of the relationships between competition and banking system performance have been analyzed in the theoretical literature and even empirically in some country studies, cross-country empirical research has so far mainly investigated the effects of regulations and specific structural or other factors on banking performance. For example, in a broad survey of rules governing banking systems, Barth et al. (2001) document for 107 countries various regulatory restrictions that were in place in 1999 on commercial banks, including various entry and exit restrictions and practices. Using this data, Barth et al. (2003) document (among other things) that tighter entry requirements are negatively linked with bank efficiency, leading to higher interest-rate margins and overhead expenditures, and that restricting foreign bank participation tends to increase bank fragility. There have also been a number of recent cross-country studies on the effects of the structure of banking systems on financial sector stability, access to financing, and growth (see Berger et al. (2004) for a review). For example, Demirgüç-Kunt et al. (2004) investigate the effects of regulations, market structure, and institutions on the cost of financial intermediation.

Cross-country research on the effects of competition in banking systems is still at an early stage, however. The interpretation of the existing empirical work using measures of regulations, market structure, and institutions is not always clear because some theoretical issues have not always been taken into account. In particular, the long-existing theory of industrial organization has shown that the competitiveness of an industry cannot be measured by market structure indicators alone (such as the number of institutions, Herfindahl or other concentration indexes, or ownership structure, such as the degree of foreign or state ownership). Rather, establishing the degree of effective competition requires a structural model. To date, however, most papers have not investigated the degree of competition in the banking system using a specific structural model. Hence, their results concerning the effect of market structure on banking system performance, firm financing, and growth could reflect factors other than competition.

A more industrial organization-based approach to assessing the degree of competition in the financial sector allows us to overcome the concerns raised by the contestability literature. An additional measure will also allow a comparison of results to approaches using banking system structures. In a previous paper (Claessens and Laeven 2004), we applied such a structural competition test to 50 countries' banking systems and documented this measure of competition for a large cross-section of countries. In addition, we investigated how market structure, entry and activity regulations, and the presence of foreign banks affected the competitive conditions of banking systems. We did not, however, investigate the relationship of this competition measure to growth or other economic variables.

One manner of clarifying the theoretically ambiguous relationships between banking system competition and the provision of external financing is to investigate how the degree of competition affects the growth of firms that vary in their dependence on external financing. This can be done using the empirical setup developed by Rajan and Zingales (1998; hereafter RZ). Using sectoral growth data for a large sample of countries, RZ assess the relationship between financial development and growth in value added of sectors that vary in their external financial dependence. The methodology of RZ has been adapted in a number of ways to assess the impact on industrial growth of banking system concentration, the development of trade finance, and the strength of property rights.¹ This paper further adapts the methodology to explore the relationships between banking system competition and growth.

We find that our competitiveness measure is positively associated with countries' industrial growth, suggesting that more competitive banking systems are better at providing financing to financially dependent firms. We find no evidence that market structure—that is, concentration in the banking system—helps predict industrial sector growth. Thus, the view that market power in banking is good for firm access to financing finds no support. Rather, there is support for the view that more competition may reduce hold-up problems and lower the costs of financial intermediation, making financially dependent firms more willing to seek (and more able to obtain) external financing. These effects are robust to a number of sensitivity tests using different measures of financial sector development, different time periods and

¹ Other papers that use this approach include, among others: Cetorelli and Gambera (2001), which investigates the effects of bank concentration on sectoral growth; Fisman and Love (2003), which investigates the effects of trade credit usage on sectoral growth; and Claessens and Laeven (2003), which investigates the role of property rights in growth.

instrumental variables techniques, and controlling for the degree of growth opportunities facing industries.

The results, however, still come with some caveats. It could be that some market power increases financial stability and thereby influences industrial growth positively over long periods. This effect is not necessarily captured in our analysis, since the sample we use is relatively short. Furthermore, although we conducted a number of robustness tests, we did not control for all factors that have been found to affect financial sector development and functioning; our competition measure may unwittingly capture these other factors. Still, the results suggest that competition is an aspect of overall financial system functioning that is well worth analyzing.

The outline of the paper is as follows. Section 2 provides a review of the theory and related empirical, cross-country literature on the effects of competition in the financial sector on growth. It also reviews the methodology used to measure the degree of competition in the banking market of a particular country, provides references to existing studies using this measure, and provides the empirical setup we use for the growth regressions. In Section 3, the data are presented. The main empirical results regarding banking system competition and industrial growth are provided in Section 4, and robustness tests are presented in Section 5. Our conclusions are presented in Section 6.

2. LITERATURE REVIEW AND METHODOLOGY

We are interested in studying the effects of banking system competition on economic growth. Specifically, we would like to know whether industrial sectors that typically use more external financing grow faster in countries with more competition in their banking systems. Theoretical work suggests an ambiguous relationship between the degree of banking system competition and firm access to external financing and, in turn, firm growth. On one hand, more competitive banking systems may channel less financing to firms because they have less of an incentive to invest in close relationships with firms (Rajan 1992; Petersen and Rajan 1995). As a consequence, especially those firms and sectors that are heavily dependent on external financing should grow more slowly in systems that are more competitive. On the other hand, a hold-up problem can arise under close relationships because borrowers cannot easily break from a lending relationship without providing an adverse signal of their own quality. Theoretical work has suggested that such hold-up problems occur less often in more competitive financial systems and, for that reason, firms may be more willing to enter close relationships with a bank under more competition (Boot and Thakor 2000). Conversely, with more competition, firms—especially those heavily dependent on external financing should grow faster. Additionally, it is likely (as in other industries) that, under more competition, a financial system provides a broader range of better-quality financial services at lower costs and in that way improves industrial growth; again, this is especially true for financially dependent firms.

To date, there have been only a few cross-country papers studying the impact of banking system structure on growth. One test of whether more banking system competition positively

affects firms' ability to attract financing— and, through that channel, growth— is to investigate if external financially dependent sectors grow faster in countries with greater competition. Building on the empirical methodology of Rajan and Zingales (1998), the cross-sectional study of Cetorelli and Gambera (2001) documents that banking sector concentration exerts a depressing effect on overall economic growth even as it promotes the growth of industries that depend heavily on external finance. Using the same data and similar methodology, Deidda and Fattouh (2002) find that banking concentration is negatively associated with per capita growth and industrial growth only in low-income countries, while there is no significant relationship between banking concentration and growth in high-income countries. Dell'Ariccia and Bonaccorsi di Patti (2004) also employ this approach and find that banking system concentration has a positive effect on firm creation. They also find, however, that the degree of information asymmetries in the country limits the overall positive effects of banking system concentration on firm credit, which is consistent with theories claiming that concentration may reduce credit to informationally opaque firms. Cetorelli (2001) also uses this methodology and finds that banking concentration enhances industry concentration, especially in sectors highly dependent on external finance, although these effects are stronger in countries with less-developed financial systems.

Thus, although existing empirical work has shown some relationships between market structure and growth, the link from market structure to degree of competition is not clear—as highlighted by the general contestability literature (Baumol et al. 1982). Specifically, measures such as banking system concentration do not necessarily capture the degree of effective competition, which actually depends on the contestability of the system. An industrial

organization-based approach to assessing the degree of competition in the financial sector allows one to overcome these concerns. The Panzar and Rosse (1987) methodology provides such a theoretically better-supported measure of competition, a model that has also been used to estimate the competitiveness of banking industries. We will now provide more detail on this competition measure and accompanying estimation techniques. Following this, we discuss some other studies that have used this methodology and present, in detail, the technique for estimating the relationship between growth and this competition measure.

The methodology of Rosse and Panzar (1977)—as expanded by Panzar and Rosse (1982) and Panzar and Rosse (1987), and hereafter denoted PR—uses data at the firm (or bank) level. It investigates the extent to which a change in factor input prices is reflected in (equilibrium) revenues earned by a specific bank. Specifically, the PR H -statistic is calculated using reduced-form bank revenue equations and measures the sum of the elasticities of the total revenue of the bank with respect to the bank's input prices. The reduced-form revenue equation to be estimated for each banking system is as follows:

$$\ln(P_{it}) = \alpha_i + T_t + \beta_1 \ln(W_{1,it}) + \beta_2 \ln(W_{2,it}) + \gamma_1 \ln(Y_{1,it}) + \gamma_2 \ln(Y_{2,it}) + \gamma_3 \ln(Y_{3,it}) + \varepsilon_{it}, \quad (1)$$

where the subscript i denotes bank i and the subscript t , year t . In terms of variables, P_{it} is the ratio of total revenue to total assets (including both gross interest revenues and noninterest income), α_i are bank fixed effects, T_t are time dummies, $W_{1,it}$ is the ratio of interest expenses to total deposits and money market funding (proxy for input price of deposits), and $W_{2,it}$ is the ratio of overhead expenses to total assets. The $Y_{i,t}$ variables are bank-specific controls. The H -statistic

equals $H = \beta_1 + \beta_2$. Under perfect competition, an increase in input prices raises both marginal costs and total revenues by the same amount as the rise in costs. Under a monopoly, an increase in input prices will increase marginal costs, reduce equilibrium output, and (as a result) reduce total revenues.² The PR H -statistic can thus be interpreted as follows: $H < 0$ indicates a monopoly; $H = 1$ indicates perfect competition; and $0 < H < 1$ indicates monopolistic competition.³

A number of papers have applied the PR methodology to the issue of competition in the financial sector, although mostly to the banking system specifically.⁴ Shaffer (1982) was one of the first to apply the PR model to banks. He estimated it for New York banks using data for 1979 and found monopolistic competition. Nathan and Neave (1989) study Canadian banks. Others have studied some non—North American and non-European banking systems. In Japan, for example, Molyneux et al. (1996) find evidence of a monopoly situation in 1986—1988. A number of papers have studied European banking systems.⁵ Although the findings are somewhat varied, the papers generally reject both perfect collusion and perfect competition, finding mostly evidence of monopolistic competition (Bikker and Haaf (2001) summarize the results of ten such

² This interpretation assumes that the test is undertaken on observations that are in long-run equilibrium. Therefore, we also tested whether the observations were in long-run equilibrium and found the tests to be satisfied. Given the short time period, we did not allow for any time variation in the H -measure. Arguably, however, liberalization and deregulation during this period has affected the degree of competition in many banking systems over time. To the extent that these have been trends affecting banking systems globally in the same way and have preserved the ranking of competitiveness among countries, there will be no bias in our tests from using a constant H -measure. Nevertheless, we did conduct tests regarding the assumption of stability in the competition measure over time (see footnote 11).

³ It can be shown that, if the bank faces a demand with constant elasticity and a Cobb—Douglas technology, then the magnitude of H can be interpreted as an inverse measure of the degree of monopoly power or, alternatively (as in Claessens and Laeven 2004), as a measure of the degree of competition.

⁴ Cetorelli (1999) provides more detail on these formal tests and reviews some of the results of previous studies of empirical banking studies.

⁵ These papers include Molyneux et al. (1994), Vesala (1995), Coccoresse (1998), De Bandt and Davis (2000), and Hempel (2002). The countries covered, the time periods, and some of the assumptions used vary among the studies.

studies). Bikker and Groeneveld (2000), for example, find monopolistic competition in all of the 15 EU countries they study.

To date, tests are few on the competitiveness of banking systems for developing countries and transition economies using these models, but studies again find mostly evidence of monopolistic competition. Belaisch (2003) finds evidence of a nonmonopolistic market structure in Brazil. Gelos and Roldos (2002) analyze a number of banking markets, including some developing countries. They report that, overall, banking markets in their sample of eight European and Latin American countries have not become less competitive, although concentration has increased. They conclude that lowered barriers to entry, such as allowing increased entry by foreign banks, appear to have prevented a decline in competitive pressures associated with consolidation. Levy Yeyati and Micco (2003) find similar results for their sample of Latin America countries and also find that the consolidation in the 1990s may have, if anything, led to more rather than less competition. Philippatos and Yildirim (2002) investigate fourteen Central and Eastern European banking systems and find (except for Latvia, Macedonia, and Lithuania) that these banking systems cannot be characterized either as perfectly competitive or as perfectly monopolistic.

When studying the effects of banking system competition on growth, we need—besides a good measure of effective competition—to control for other country circumstances that may be correlated with competition but that, in effect, may determine the growth effects. Otherwise, the incorrect conclusion that competition is (or is not) important could be reached. There are several possible approaches to controlling for other country conditions, but the setup of Rajan and

Zingales (1998; hereafter RZ), which has been used in a number of tests, is innovative and very much applicable for our empirical tests on the effects of competition in the banking system on economic growth in terms of the degree of access to external financing. Next, we provide more detail on the RZ approach.

The RZ model relates the growth in real value added in a sector in a particular country to a number of country- and industry-specific variables. In the case of RZ, the specific test focuses on financial development. The question of RZ is whether financially dependent firms can be expected to grow more in countries with a higher level of financial development. The authors use U.S. firm data as proxy at the industry level to derive the typical external financial dependence for a particular industrial sector. Their presumption is that the well-developed financial markets in the United States should allow U.S. firms to achieve the desired financing for their respective industrial sector. This offers a way of identifying the degree to which industries desire external financing anywhere in the world.⁶ The innovation of the RZ approach is in positioning an interaction between a country characteristic (its financial development) and this (benchmark) external financial dependence of a given industry. It then investigates how industrial growth relates to this interaction term, thereby investigating whether industrial sectors that typically use more external financing grow faster in countries with greater financial sector development. This overcomes some of the identification problems encountered in standard cross-country growth regressions. The approach is also less subject to criticism regarding an

⁶ The advantage of this approach is that one does not need information on the actual external financing dependence for industries in different countries. The comparability of such data would be reduced because accounting practices differ around the world. It does assume that there are technological and economic reasons why some industries depend more on external finance than do others, and that these differences, to a large degree, prevail across countries. This does not mean that the model assumes a sector in two countries with the same degree of financial development to have exactly the same optimal external financing structures. Local conditions, such as growth opportunities, are allowed to differ between countries. The model assumes only that the rank order of optimal external financing needs across industries is similar across countries.

“omitted variable” bias or model specification than are traditional approaches that relate financial sector development directly to economic growth, even when considering other country characteristics. In the regression results explaining sectoral growth, RZ find a positive sign for the interaction between the external financial dependence ratio and the level of financial development, thus demonstrating a positive impact of financial development on growth due to greater availability of external financing.

We expand the RZ model, as others have done, to test for the effect of competition in the banking system on growth and the specific channels through which competition may affect growth. Specifically, we add to the RZ model our *H*-measure of the degree of competition in the country’s banking system as a term that interacts with the sectoral measure of financial dependence. Using the interaction variable between each industrial sector’s external financing dependence and the index of the degree of competition in the country’s banking system, we test whether industrial sectors that typically require more external financing grow faster in countries with more competition in their banking systems. To allow for comparisons with RZ and to control for the effects of financial sector development on growth, in most regressions we also include financial dependence interacted with financial development.

In order to control for differences in growth potential across industries, in their regressions, RZ also include the industry’s market share in total manufacturing in the specific country. Industries with large shares in value added may have less growth potential than industries with small initial shares when there is an industry-specific convergence effect. The initial share may also help to control for other variations between countries, such as in their

initial comparative advantage among certain industries based on factors other than financial development and banking system competition; RZ also use country and industry dummies to control for any remaining country-specific and industry-specific factors. We do likewise and end up with the following specification:

$$\begin{aligned}
 \text{Growth}_{j,k} = & \text{Constant} + \boldsymbol{\psi}_1 \cdot \text{Industry dummies}_j \\
 & + \boldsymbol{\psi}_2 \cdot \text{Country dummies}_k \\
 & + \boldsymbol{\psi}_3 \cdot \text{Industry share of manufacturing value added}_{j,k} \\
 & + \boldsymbol{\psi}_4 \cdot \text{Financial dependence}_j \cdot \text{Financial development}_k \\
 & + \boldsymbol{\psi}_5 \cdot \text{Financial dependence}_j \cdot \text{Competition Index}_k \\
 & + \varepsilon_{j,k},
 \end{aligned} \tag{2}$$

where each industry is indicated by index j and each country by index k . Greek letters in bold indicate vectors of coefficients, indexed by industry j or country k . Growth is the average annual real growth rate of value added in industry j in country k .

With these specifications, some of our regressions are similar to those of Cetorelli and Gambera (2001), Deidda and Fattouh (2002), and Dell’Ariccia and Bonaccorsi di Patti (2004), except that they all use banking sector concentration instead of our measure of bank competition. To allow for direct comparisons, we also run the regressions with the banking sector concentration measure used by Cetorelli and Gambera (2001; henceforth CG), again interacted with financial dependence, instead of the competition measure. Although both the competition and the concentration measure refer to the banking system, the two can capture quite different aspects. Claessens and Laeven (2004; henceforth CL) related their estimated H -measure of competitiveness for 50 countries to the countries’ structural and regulatory indicators. Contrary to the assumption maintained in much of the literature that more concentrated banking systems

are less competitive, they did not find any evidence that banking system concentration is negatively related to the H -measure. In fact, CL found some evidence that more-concentrated banking systems are more competitive. Their H -statistic estimates, for example suggest that some countries with highly concentrated banking markets, such as the Netherlands, have very competitive banking systems. They also found that systems with greater foreign bank entry and lack of restrictions on entry and activity have a higher competitiveness score. Thus, it can be seen that the degree of banking system concentration and degree of competition need not capture similar aspects.

3. DATA

We use industry-specific and country-specific data from a variety of sources. Table 1 presents an overview of the variables used in our empirical analysis together with their sources. Most of the variables are self-explanatory and have been used by RZ or CG. For our dependent variable, growth in value added, we have data on value added from the UNIDO database (United Nations Database on Industrial Statistics). For most regressions, we use the growth in value added over the period 1980—1990 (as RZ do). We also have figures for growth in value added for the period 1980—1997, which we use as a robustness test. We always use the average rates of growth over the period under study.

As a measure of external financial dependence at the sectoral level, we use the data from RZ, who assume that the external financing ratio for each industry in the United States

constitutes a global benchmark of each sector's need for external financing. The authors calculate the external financial dependence ratios by industry using Compustat data on U.S. firms for the years 1980 to 1989. We simply use their data for this measure.

Table 1: Definition and source of the variables.

| Variable | Description |
|----------------------|---|
| Growth | Average annual real growth rate of value added in a particular sector in a particular country over the period 1980 to 1990. The sectors are classified on the basis of ISIC. Source: Rajan and Zingales (1998). Original source: United Nations Database on Industrial Statistics. |
| Growth8097 | Average annual real growth rate of value added in a particular sector in a particular country over the period 1980 to 1997, if available. The sectors are classified on the basis of ISIC. Source: Authors' calculations based on data from the United Nations Database on Industrial Statistics. |
| Share in value added | Fraction of ISIC sector in value added of total manufacturing sector in 1980. Source: Rajan and Zingales (1998). |
| Financial dependence | External financial dependence of U.S. firms by ISIC sector averaged over the period 1980 to 1989. Source: Rajan and Zingales (1998). |
| Private credit | Private credit divided by GDP in 1980. Source: Rajan and Zingales (1998). |
| Market cap | Stock market capitalization divided by GDP in 1980. Source: Rajan and Zingales (1998). |
| Total capitalization | Sum of the private credit and stock market capitalization variables. |
| Concentration | Measure of bank concentration. Sum of the market shares measured in total assets of the three largest banks for the period 1989 to 1996, when available. Source: Cetorelli and Gambera (2001). |
| Competition | Measure of bank competition. Average <i>H</i> -statistic for the period 1987—1996. Source: Author's calculations using data from Bankscope and following the methodology in Claessens and Laeven (2004). |
| Accounting | Measure of accounting standards in the country in 1983. Source: Rajan and Zingales (1998). |
| Property rights | Measure of property rights. Median value over 1995—99; score from 1 to 5. A higher score denotes greater protection of property. Source: Heritage Foundation. |
| GDP per capita | The logarithm of GDP per capita in 1980. Source: World Development Indicators of the World Bank. |
| Legal origin | Identifies the legal origin of the company law or commercial code of each country. There are four possible origins: (1) English common law; (2) French commercial code; (3) German commercial code; and (4) Scandinavian commercial code. Source: La Porta et al. (1998). |

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

Also in line with RZ, we use as proxies for countries' financial development the following variable: first, the ratio of total capitalization to GDP, with total capitalization defined as the sum of domestic credit to private sector (as provided by the World Development Indicators) and stock market capitalization (as provided by the S&P, formerly IFC, Emerging Markets Database).⁷ Although we mostly use total capitalization to GDP, we also study separately the two subcomponents, private credit to GDP and stock market capitalization to GDP. Furthermore, as RZ did, we use the quality of the country's accounting standards as provided by CIFAR (Centre for International Financial Analysis and Research) as a measure of financial sector development. The financial development measures apply to the beginning of our sample (1980) and the accounting standards measure to 1983, the earliest period for which the index on accounting standards is available (we also used 1990 data and found similar results).

As our measure of the degree of competition in the banking system, we estimate the H -measure using the PR methodology, just as CL did. In CL the H -measure was estimated over the period 1994—2001, a period for which more individual bank data are available from Bankscope. For our purposes, the 1994—2001 period is less attractive because it does not overlap much with the period for which we measure the growth rate of value-added, 1980 to 1990, or the period for which benchmark external financing needs are calculated, 1980 to 1989. Bankscope does not, however, cover a large enough sample of countries before 1987. We also need to estimate the H -statistics over several years (we choose a period of ten years) to have

⁷ In RZ, total domestic credit to GDP is used as a measure of financial development; the authors refer to the sum of total domestic credit to GDP and stock market capitalization to GDP as “total capitalization”. Here, we focus on domestic credit to the private sector and use “total capitalization” to denote the sum of private credit to GDP and stock market capitalization to GDP. We prefer to use private credit as the measure of banking sector development because it covers credit extended to the private sector and does *not* include credit extended to governments, government agencies, and public enterprises, as is typical of many other analyses (e.g., Beck et al. 2000). However, including credit to the public sector in the measure of total capitalization does not change our results.

enough observations (many countries have only a few banks). Therefore, to estimate the degree of competition, we use the available data from Bankscope for the period 1987—1996, exploring the variation across banks and over time. We do investigate, however, the stability of the competition measure over this period.

When estimating H , we include several control variables at the individual bank level—specifically, the ratio of the bank’s equity to total assets, the ratio of net loans to total assets, and the logarithm of total assets (in order to control for potential size effects). We estimate the model for each banking system using OLS with fixed bank-specific effects. We also include time dummies for each banking market and exclude countries with fewer than 20 bank-year observations. As a consequence, our sample reduces to 20 countries. We estimate H , and the standard deviation of H , and we check whether H is significantly different from 0 or 1. In all cases, statistically H is significantly different from 0 (at the 1% level). Only the banking system in Netherlands has an H not statistically significantly different from 1 (perfect competition) at the 1% level (Norway as well, but at the 5% level). We also perform equilibrium tests and find most countries to be in equilibrium.⁸ Alternatively, instead of the competition measure, we use data on the banking system concentration ratio (top three banks) of CG, in which case the specification is the same as theirs.

⁸ In this model, by replacing P (the total revenues to total asset ratio) by the pretax return on assets ratio and then running the same regressions, we can conduct equilibrium tests. We found most countries to be in equilibrium, i.e., the competition measures H when using the pretax return on assets ratio as dependent variable is not significantly different from 0. Appendix Table II provides standard deviations and significance tests of the individual H -measures.

The dataset of RZ includes 42 countries. When we merge it with the countries for which we estimate the competitiveness measure, the number of countries included in our dataset drops quite a bit; we are left with 17 countries. For the growth regressions, as in RZ, we need to drop the benchmark country (the United States) and hence are left with 16 countries. In all regressions, we use country dummies to control for country differences and use industry dummies to correct for industry-specific effects.

Table 2 presents the summary statistics of the country-specific variables (Appendix Table I presents the same statistics for growth, total capitalization, concentration, and competition—but by individual country). The average sectoral real growth rate is 3.5%. The average sector requires some 31% of external financing for its investments. Total capitalization to GDP is on average some 38% but with large variations across countries, from a low of 75% to a high of 219%. The top-three banking concentration measure is on average 55% but also with significant variation, from a low of 21% (Japan) to a high of 87% (Jordan). The average competitiveness measure is 0.72, with a low of 0.46 (Egypt) and a high of 1.0 (Netherlands), indicating that some form of monopolistic competition is most typical of the 16 banking systems.

Table 2: Summary statistics.

| Variable | Mean | Standard deviation | Minimum | Maximum | Number of observations |
|----------------------|--------|--------------------|---------|---------|------------------------|
| Growth | 0.0349 | 0.0920 | -0.4474 | 1.0000 | 1251 |
| Share in value added | 0.0156 | 0.0208 | 0.0000 | 0.2244 | 1297 |
| Financial dependence | 0.3136 | 0.3971 | -0.4512 | 1.4915 | 1412 |
| Total capitalization | 0.5803 | 0.3889 | 0.0704 | 2.1903 | 1452 |
| Concentration | 0.5518 | 0.1797 | 0.2100 | 0.8700 | 1452 |
| Competition | 0.7181 | 0.1449 | 0.4615 | 1.0123 | 575 |

Note: This table reports the summary statistics of the main regression variables. Definitions and data sources of the variables are in Table 1.

Table 3 is a correlation matrix whose statistics show that there are some important correlations among the variables. Growth in value added is negatively correlated with the share in value added, indicating a convergence effect whereby industries with a large share in value grow more slowly. As shown in previous work, there is a positive correlation between growth in value added and the degree of financial sector development. Noteworthy for our analysis, there is a negative correlation between growth in value added and the competitiveness measure. This suggests that more-competitive systems may be worse in fostering growth. The concentration index is not (statistically) significantly correlated with the competitiveness measure. Using a larger sample and controlling for some other country factors, CL found this relationship to be statistically significant and positive, in contrast to the belief that more-concentrated financial systems are less competitive. The concentration measure is, however, significant negatively correlated with growth in value added, suggesting that more concentrated systems are less conducive to growth. There is also a positive relation between the development of the financial system and its level of competitiveness. These results indicate that analyzing the effects of competition, financial development, and banking system structure on the level of external financing available and growth could well amount to different exercises. These raw correlations do not, however, control for other country characteristics.

Table 3: Correlation matrix.

| | Growth | Share in value added | Financial dependence | Total capitalization | Concentration | Competition |
|----------------------|-------------------|----------------------|----------------------|----------------------|------------------|-------------|
| Growth | 1 | | | | | |
| Share in value added | -0.132 (0.000) | 1 | | | | |
| Financial dependence | 0.071 (0.013) | -0.074 (0.008) | 1 | | | |
| Total capitalization | 0.080 (0.005) | 0.016 (0.568) | -0.002 (0.938) | 1 | | |
| Concentration | -0.104 (0.000) | 0.058 (0.037) | 0.007 (0.806) | 0.021 (0.431) | 1 | |
| Competition | -0.131 (0.002) | 0.152 (0.000) | 0.001 (0.982) | 0.139 (0.001) | 0.042 (0.313) | 1 |

Note: This table reports the correlation matrix of the main regression variables. *p*-values of significance tests are reported in parentheses below the correlation coefficients. Definitions and data sources of the variables are in Table 1.

4. EMPIRICAL RESULTS

The regression results are presented in this section. In the first set of regressions, the dependent variable is the average annual real growth rate of value added in a particular sector in a particular country over the period 1980 to 1990, with one observation per sector in each country. We first discuss the basic regression specifications, which are estimated using OLS. Industry dummies and country dummies (not reported) are used in all regressions. The basic results are presented in Table 4. The sample varies: In the first two regressions, without the competitiveness measure, we use 41 countries to replicate (as closely as possible) the RZ and CG results;⁹ for the other regressions, when we use the competitiveness measure, we have 16 countries.

The industry's market share in total manufacturing in a specific country has a negative sign in all regressions (columns 1 – 7), in line with RZ, suggesting that there is convergence in growth across industries. In terms of the original RZ hypothesis, we find that industrial sectors that rely relatively more on external finance develop disproportionately faster in countries with better-developed financial markets because the coefficient for the interactive variable (total capitalization/GDP times external financial dependence) is positive and statistically significant at the 1% level (column 1). Hence, consistent with the findings of RZ, we find that financial development facilitates economic growth through greater availability of external financing.

⁹ Our regression coefficients are not exactly identical to those reported by RZ because they include domestic credit to the public sector in their measure of financial development (total capitalization), whereas we include only private credit.

Table 4: Financial dependence, banking sector competition, and growth.

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
|---|----------------------|----------------------|---------------------|--------------------|---------------------|---------------------|---------------------|
| Share in value added | -0.926*** (0.245) | -0.829*** (0.246) | -0.412** (0.173) | -0.290* (0.164) | -0.346** (0.173) | -0.442** (0.178) | -0.442** (0.179) |
| Total capitalization · Financial dependence | 0.071*** (0.021) | | 0.053*** (0.017) | | | 0.047*** (0.016) | 0.047*** (0.016) |
| Concentration · Financial dependence | | 0.015 (0.044) | | -0.057 (0.044) | | | -0.002 (0.042) |
| Competition · Financial dependence | | | | | 0.144*** (0.051) | 0.120** (0.049) | 0.120** (0.049) |
| Industry dummies | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Country dummies | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 1217 | 1217 | 531 | 531 | 531 | 531 | 531 |
| Number of countries | 41 | 41 | 16 | 16 | 16 | 16 | 16 |
| R^2 | 0.29 | 0.28 | 0.39 | 0.38 | 0.39 | 0.40 | 0.40 |

Notes: Dependent variable is real growth in sectoral value added over the period 1980—1990. Regressions are estimated using OLS and include industry and country dummies (not reported). Robust standard errors in parentheses. Definitions and data sources of the variables are in Table 1. * significant at 10%; ** significant at 5%; *** significant at 1%.

In terms of the effect of banking system concentration, we find no statistically significant effect of the interaction between banking system concentration and financial dependence on growth in value added. This contrasts with Cetorelli and Gambera (2001) who do find that more-concentrated banking systems have higher growth in value added for financially dependent firms. The difference may be due to the sample of countries covered. Also, in their analysis they focus on the external financing needs of young firms (less than ten years old), whereas we study the relation between growth and financial dependence of all firms. To compare the results when we use the banking system competitiveness variable, we next perform the same first two regressions on the smaller sample for which we also have the competitiveness measure (columns 3 and 4). We find that the results are maintained: financial development improves the growth of more financially dependent sectors, while the interaction between banking system concentration and financial dependence is not significantly related to growth.

We next introduce our competitiveness measure. We find that industrial sectors using relatively more external financing develop faster in countries with more competitive banking systems, since the coefficient for the variable financial dependence interacted with the competitiveness measure is statistically significant and positive (column 5). Hence, more competition in the banking system facilitates the economic growth of those industries that are more dependent on external financing. These results do not support the view that market power is good for external financially dependent sectors when a more complete measure of competition is used.

The competition effect on growth appears to be in addition to the increase in firm growth due to greater external financing availability. This is because in the regressions where both the interaction variables—external financial dependence with financial development and external financial dependence with the competitiveness measure—are included (column 6), both interactive variables are significantly positive. Furthermore, when also including the interaction variable external financial dependence with concentration, we find that the coefficient on the concentration measure is not statistically significant, but the other two remain so (column 7). The coefficients of the financial development and competitiveness variables are actually of similar magnitudes in regression 6 and 7, as in the earlier regressions for the same sample (columns 3 and 5), which supports the robustness of our results.

To interpret these results, we need to consider the size of the coefficients and the average values of the financial development and competition variables. We first use the regression estimates to infer the differential impact of financial sector development on growth of a financially dependent industry in two countries that differ in their level of financial development. (In all these calculations, we set the industry's share in value added at its overall mean.) If we take one industry at the 75th percentile of external financial dependence shipbuilding and repairing, (e.g., with an external financial dependence of 0.46) and another industry that is at the 25th percentile (manufacture of other non metallic mineral products, with an external financial dependence of 0.06), then it follows from the regression results presented in Table 4 (column 3) that the difference in growth rates between these industries is 1.2 percentage points higher in Spain, a country that is at the 75th percentile of financial development (with total capitalization of 0.85) than in Pakistan, a country at the 25th percentile of financial development (with total

capitalization of 0.28). In other words, in terms of growth, moving from Pakistan to (more financially developed) Spain benefits highly financially dependent industries more.

We next analyze the effects of a different degree of competition in the financial system. We again compare an industry at the 75th percentile of financial dependence, shipbuilding and repairing, with one at the 25th percentile, manufacture of other non metallic mineral products. Using the OLS regression results presented in Table 4 (column 5), we find that the difference in growth between these industries is 1.2 percentage points higher in Sweden, a country at the 75th percentile of degree of competition (with an *H*-statistic of 0.82) than in India, a country at the 25th percentile of degree of competition (with an *H*-statistic of 0.61). In other words, in terms of growth, moving from India to (more competitive) Sweden again benefits highly financially dependent industries more. Since the average growth in real value added is 3.5% these effects are substantial. It is important to observe that, the effects of financial development and competition on growth are of similar magnitude.

5. ROBUSTNESS TESTS

We next conduct a number of robustness tests. We start by using a different sample period. In the basic test, we use the same time period for growth in value added as in RZ, 1980—1990. However, the data from which we estimated the banking system competition measures covered the 1987—1996 period and thus do not exactly coincide with the period of our dependent variable (1980—1990). We also have growth data over the period 1980—1997,¹⁰ which provides for a larger overlap with the period for which we estimate the degree of banking

¹⁰ We extend the growth rates into the 1990s using data from the UNIDO database, the same source used in RZ.

competition. But over a longer period, other factors can affect growth, and the degree of competition may change over time.¹¹ Using the same regressions as before, the results using the 1980—1997 data are reported in Table 5.

The results are very similar to those reported in Table 4, with greater financial development and more banking system competition each exerting a positive effect on sectoral growth in all regression specifications, and with coefficients of similar magnitude. Banking system concentration remains insignificant in all specifications.

¹¹ We checked the stability of the competition measure over time by splitting the sample period for which competition was estimated into two equal periods, 1987—1991 and 1992—1996. See Appendix Table III for the specific measures. We find a high correlation between the competition measures estimated for each period, 0.81, and strong correlations between the competition measures estimated for each period and the degree of competition for the whole period, 0.85 for the first and 0.99 for the second period. We also find no obvious trend, as the average competition measure for the first period is 0.75 and for the second period is 0.71, while the overall average is 0.72. We do not resort to using the *H*-statistic estimates for the period 1987—1991 because these estimates are available for eight countries only; we require a sample of at least 20 bank-year observations for each country in order to estimate *H*.

Table 5: Growth over the period 1980—1997.

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
|---|----------------------|----------------------|---------------------|-------------------|--------------------|---------------------|---------------------|
| Share in value added | -0.794*** (0.249) | -0.724*** (0.249) | -0.252 (0.158) | -0.155 (0.151) | -0.197 (0.158) | -0.274* (0.163) | -0.271* (0.163) |
| Total capitalization · Financial dependence | 0.053*** (0.019) | | 0.042*** (0.015) | | | 0.038*** (0.014) | 0.037*** (0.014) |
| Concentration · Financial dependence | | -0.003 (0.035) | | -0.054 (0.043) | | | -0.013 (0.040) |
| Competition · Financial dependence | | | | | 0.105** (0.044) | 0.085** (0.043) | 0.084** (0.042) |
| Industry dummies | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Country dummies | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 1217 | 1217 | 531 | 531 | 531 | 531 | 531 |
| Number of countries | 41 | 41 | 16 | 16 | 16 | 16 | 16 |
| R^2 | 0.30 | 0.29 | 0.45 | 0.44 | 0.44 | 0.45 | 0.45 |

Notes: Dependent variable is real growth in sectoral value added over the period 1980—1997, when available. Regressions are estimated using OLS and include industry and country dummies (not reported). Robust standard errors in parentheses. Definitions and data sources of the variables are in Table 1. * significant at 10%; ** significant at 5%; *** significant at 1%.

As a subsequent robustness test, we investigate two issues: whether our specific measure of financial sector development affects the results; and whether the financial sector development measure is a proxy for other aspects of countries' institutional development. So far, we have used total capitalization—the sum of private credit to GDP and stock market capitalization to GDP—as of the beginning of the period, 1980. We now use its subcomponents, private credit and stock market capitalization, both as of 1980. In addition, we use market capitalization as of the end of the period, 1990. This way, we investigate whether the orientation of the countries' financial system toward banking intermediation or markets affects the results and whether financial sector development throughout the period, or rather initial development, is more important.

Table 6 (columns 1—3) presents these results. We find that the interaction between private credit to GDP and external financial dependence in 1980 is not statistically significant, whereas the interactions between market capitalization to GDP in 1980 and external financial dependence and between market capitalization in 1990 and external financial dependence are both statistically significant and are both positive. We emphasize that the interaction between our competition measure and financial dependence remains statistically significant and positive in all three regressions. These results confirm that competition in the banking system matters for improved access to all forms of external financing (including from nonbanks), regardless of whether we control for the development of private credit markets or of stock markets. Furthermore, it shows that the results are indifferent to the particular time at which financial sector development is measured.¹²

¹² We also used the average ratios of private credit and stock market capitalization over the 1980—1990 period and found similar results.

Table 6: Banks versus markets, accounting, and property rights.

| | (1) | (2) | (3) | (4) | (5) |
|--|---------------------|---------------------|---------------------|---------------------|---------------------|
| Share in value added | -0.373** (0.172) | -0.438** (0.179) | -0.409** (0.176) | -0.379** (0.173) | -0.442** (0.178) |
| Private credit in 1980 · Financial dependence | 0.059 (0.038) | | | | |
| Market capitalization in 1980 · Financial dependence | | 0.058*** (0.020) | | | |
| Market capitalization in 1990 · Financial dependence | | | 0.001*** (0.000) | | |
| Total capitalization in 1980 · Financial dependence | | | | 0.043** (0.018) | 0.049** (0.021) |
| Competition · Financial dependence | 0.101* (0.061) | 0.157*** (0.052) | 0.111** (0.048) | 0.109* (0.057) | 0.124** (0.063) |
| Accounting standards · Financial dependence | | | | 0.082 (0.059) | |
| Property rights · Financial dependence | | | | | -0.002 (0.011) |
| Industry dummies | Yes | Yes | Yes | Yes | Yes |
| Country dummies | Yes | Yes | Yes | Yes | Yes |
| Observations | 531 | 531 | 531 | 390 | 531 |
| Number of countries | 16 | 16 | 16 | 12 | 16 |
| R^2 | 0.39 | 0.40 | 0.40 | 0.43 | 0.40 |

Notes: Dependent variable is real growth in sectoral value added over the period 1980—1990. Regressions are estimated using OLS and include industry and country dummies (not reported). Robust standard errors in parentheses. Definitions and data sources of the variables are in Table 1. * significant at 10%; ** significant at 5%; *** significant at 1%.

We next investigate whether the results may reflect factors other than financial sector development. It could be that the particular combination of greater financial sector development, more competition, and higher sectoral growth is more likely in countries that are institutionally or otherwise better developed in ways that correlate with our competition measure (note that the regressions include country dummies, thus controlling for any other country differences). The regression results so far could then lead to the incorrect conclusion that it is financial sector development and competition rather than other forms of (institutional) development that drive growth. It is difficult to control for all forms of such development that might be correlated with competition, but two logical candidates to investigate are the quality of financial information and the level of protection of property rights in the country—factors that have been found to be closely associated with financial sector development and growth. The former, as measured by an index of the quality of accounting standards, is a useful robustness measure because it reflects the potential for obtaining finance, rather than actual finance raised, and refers not just to the banking system and stock market as a source of financing but to all forms of external financing. Specifically, RZ argue that “the higher the standards of financial disclosure in the country, the easier it will be for firms to raise funds from a wider circle of investors.” The accounting standards index has been shown by RZ to have a statistically significant positive correlation to growth when interacted with financial dependence. The other institutional development indicator, an index of the degree to which property rights are perceived to be enforced in the country, has been found by a number of authors to matter for financial sector development and growth (see e.g. Beck et al. 2000).

We interact these two indexes with sectoral external financial dependence and include them one by one in our regressions. We keep in the regression our standard measure of financial sector development (stock market capitalization) interacted with external financial dependence. We find that the interactions of the accounting and property rights indexes with financial dependence themselves are not statistically significant (Table 6, columns 4 and 5). The interactions between total capitalization and financial dependence remain statistically significant and positive. Our main result—on the importance of competition for enhancing the growth of financially dependent industries—is not affected, since the interaction variable between competition and external financial dependence remains statistically significant and positive. This suggests that the finding that industries with greater financial dependence benefit in growth terms from greater competition in the financial system is not due to a better quality of financial information or improved property rights.

Although endogeneity (or omitted variables) should not be a major concern given the RZ methodology, as a second robustness test we use instrumental variables to control for the possible (residual) endogeneity of some variables. Because we have a limited number of instrumental variables, we are restricted in the actual number of independent variables that we can include at the same time. We therefore run the instrumental variables only with (a) the interaction between financial development and external financial dependence or (b) the interaction between the competition measure and external financial dependence. However, we do vary the specific measure of financial sector development and use, besides total capitalization, the quality of the country's accounting standards as measured in 1983.

The results of this robustness test—where we use the country’s legal origin as instrument, as is commonly done—are reported in Table 7. The instrumental variables (IV) regression results, presented in columns 1 and 2 of Table 7, basically confirm (for the original sample of countries) the RZ finding that financially dependent firms grow faster in more-developed financial systems, although the effect is statistically significant only when financial development is measured by the accounting standards index. We confirm these effects for the smaller set of countries for which we also have the competition measure (columns 3 and 4). Although the total capitalization interaction term is now statistically significant, the accounting interaction term is not. When we next use the legal origin as instrument for the competition variable, we find again that firms that are more financially dependent grow faster in financial systems that are more competitive, suggesting that the results do not suffer from possible endogeneity problems (column 5).

We can again provide the economic effects of these results, setting each industry’s share in value added at its overall mean. If we again take the industry at the 75th percentile of external financial dependence (ship building and repairing) and the industry at the 25th percentile of external financial dependence (manufacture of other nonmetallic mineral products), then it follows from the IV regression results presented in Table 7 (column 5) that the difference in growth between these industries is 1.6 percentage points higher in Sweden, a country at the 75th percentile of competition (with a H -statistic of 0.82) than in India, a country at the 25th percentile of competition (with a H -statistic of 0.61). This is, again, a large difference compared to the average annual growth in real value added of 3.5%.

Table 7: Instrumental variables.

| | (1) | (2) | (3) | (4) | (5) |
|---|----------------------|----------------------|---------------------|--------------------|---------------------|
| Share in value added | -0.842*** (0.241) | -0.338*** (0.118) | -0.410** (0.174) | -0.229* (0.138) | -0.363** (0.174) |
| Total capitalization · Financial dependence | 0.008 (0.037) | | 0.052* (0.031) | | |
| Accounting standards · Financial dependence | | 0.150*** (0.056) | | 0.021 (0.070) | |
| Competition · Financial dependence | | | | | 0.192*** (0.067) |
| Industry dummies | Yes | Yes | Yes | Yes | Yes |
| Country dummies | Yes | Yes | Yes | Yes | Yes |
| Observations | 1217 | 830 | 531 | 390 | 531 |
| Number of countries | 41 | 27 | 16 | 12 | 16 |
| R^2 | 0.28 | 0.30 | 0.39 | 0.41 | 0.39 |

Notes: Dependent variable is real growth in sectoral value added over the period 1980—1990. Regressions are estimated using instrumental variables and include industry and country dummies (not reported). As instrument for total capitalization and competition we use the legal origin dummy variables. Robust standard errors in parentheses. Definitions and data sources of the variables are in Table 1. * significant at 10%; ** significant at 5%; *** significant at 1%.

As a subsequent robustness test, we investigate whether our estimating the measure of competition with error affects our results. We do this in two ways. First, we perform weighted least-squares regressions using the inverse of the standard deviation of our competition measure as weights. Second, we still use OLS regressions but use the rank order of the competition measure rather than the competition variable itself as an independent variable (with the country with the lowest H -statistic having rank 1; see also Appendix Table II). Results are reported in Table 8, where we first replicate the core regression, as already reported in Table 4 (column 1). The next result using weighted regression shows that the error in the H -measure does not affect the magnitude of the coefficient for the competition measure (column 2). Neither does using the rank order alter the finding that more competitive banking systems lead to higher growth in financially dependent industries (column 3). Although (as expected) the coefficient in the last regression changes in magnitude, it does not change in terms of statistical significance.

Table 8: Estimation error of H -statistics.

| | (1) | (2) | (3) |
|---|---------------------|---------------------|---------------------|
| Share in value added | -0.346** (0.173) | -0.427* (0.223) | -0.344** (0.173) |
| Competition · Financial dependence | 0.144*** (0.051) | 0.146*** (0.056) | |
| Competition Rank · Financial dependence | | | 0.005*** (0.002) |
| Industry dummies | Yes | Yes | Yes |
| Country dummies | Yes | Yes | Yes |
| Observations | 531 | 531 | 531 |
| Number of countries | 16 | 16 | 16 |
| R^2 | 0.39 | 0.39 | 0.39 |

Notes: Dependent variable is real growth in sectoral value added over the period 1980—1990. Regressions are estimated using OLS and include industry and country dummies (not reported). Robust standard errors in parentheses. Definitions and data sources of the variables are in Table 1. In column (2) we use the inverse of the standard deviation of H as weight. In column (3) we use the rank of the H -statistic (where the country with the lowest H -statistic has rank 1) instead of the H -statistic as competition variable. * significant at 10%; ** significant at 5%; *** significant at 1%.

In a subsequent and last set of regressions, we test whether the results thus far capture other factors that drive sectoral growth across countries. Fisman and Love (2004; hereafter FL) have argued that it is not financial development but rather the presence of growth opportunities that drives the differences in actual growth rates of industries across countries. In their view, other factors (which happen to be correlated with financial development) determine growth opportunities across countries and so the RZ regression results simply reflect that countries with greater financial development also have a better ability to make use of such growth opportunities. It could be the same for competition: perhaps it is not a more-competitive banking system that provides more or better financing for industries that are financially dependent but rather the presence of growth opportunities, which happen to be correlated with greater competition, that allow financially dependent firms to grow faster. In this robustness test we therefore include, as FL did, the interaction between the actual sales growth rates of benchmark U.S. firms over the 1980—1990 period (using data from FL) with our competition measure. To assure comparability, we also re-run, for our sample of countries, the FL specification with financial development and growth opportunities. Table 9 reports the regression results.

The first regression result replicates the FL results (for the larger sample of 41 countries): including the measure of growth opportunities interacted with financial development is statistically significant and, importantly, after including this interaction term the interaction variable between financial development and external financial dependence is no longer statistically significant (column 1). When we next include the interaction between our competition measure and financial dependence (for the smaller sample of 16 countries), we find this interaction to be significant, while the financial development and growth opportunities

interaction term remains significant and the external financial dependence interaction term is again not significant (column 2). A more competitive banking system thus allows financially dependent industries to grow faster, even controlling for growth opportunities and general financial sector development.

We next confirm this result by excluding from the regression the interaction term between financial development and external financial dependence. We find no differences in the coefficients (in size and statistical significance) for the interaction terms financial development with growth opportunities or the competition measure with financial dependence (column 3). Finally, we apply the same logic as FL did for financial development to the competition variable: it could be that a more competitive system is not important for industries that have more need for external financing but rather for industries that have more growth opportunities (and then may need more external financing). We find that the measure of growth opportunities interacted with the competition measure is not statistically significant, whereas the interaction between competition and financial dependence remains statistically significant (column 4). This confirms that a more-competitive banking system provides external financially dependent firms with more and better access to financing, thereby allowing them to grow faster.

Table 9: Controlling for growth opportunities.

| | (1) | (2) | (3) | (4) |
|---|----------------------|---------------------|---------------------|---------------------|
| Share in value added | -0.927*** (0.247) | -0.454** (0.178) | -0.445** (0.173) | -0.345** (0.174) |
| Total capitalization · Financial dependence | 0.029 (0.023) | 0.009 (0.023) | | |
| Total capitalization · Growth opportunities | 0.703** (0.345) | 0.624* (0.343) | 0.698*** (0.248) | |
| Competition · Financial dependence | | 0.120** (0.050) | 0.123** (0.051) | 0.132* (0.076) |
| Competition · Growth opportunities | | | | 0.207 (0.990) |
| Industry dummies | Yes | Yes | Yes | Yes |
| Country dummies | Yes | Yes | Yes | Yes |
| Observations | 1217 | 531 | 531 | 531 |
| Number of countries | 41 | 16 | 16 | 16 |
| R^2 | 0.30 | 0.40 | 0.40 | 0.39 |

Notes: Dependent variable is real growth in sectoral value added over the period 1980—1990. Regressions are estimated using OLS and include industry and country dummies (not reported). Robust standard errors in parentheses. Definitions and data sources of the variables are in Table 1. Growth opportunities is sales growth at the industry level in the U.S. from Fisman and Love (2004). * significant at 10%; ** significant at 5%; *** significant at 1%.

6. CONCLUSIONS

Using a large cross-section of countries, we relate a structural measure of banking system competitiveness to industrial growth. We find that external financially dependent sectors grow faster in more-competitive banking systems. This relationship controls for the effects of overall financial sector development on the growth of external financially dependent industries, does not depend on the particular measure of financial sector development used, and is robust to the possibility of differences in growth opportunities driving results and to conducting a number of other sensitivity tests. We find no evidence that market structure—that is, concentration in the banking system—helps predict industrial sector growth. We conclude that there is no support for the view that market power is good for access to financing. The findings suggest that the degree of competition is an important aspect of financial sector development and, in turn, economic growth.

These findings do not, however, give insights on all the channels through which increased competition may affect the role of the financial sector in fostering growth. In particular, we did not investigate across countries the relationship between direct measures of the cost of financial intermediation, such as net interest margins, and our measure of competition (although that does capture the degree to which banks pass input costs on to output costs). We also did not investigate the relationship between direct measures of firms' access to external financing—such as the reported difficulty in obtaining external financing or the degree of other external financing constraints—and our measure of competition.

We did not explore all other possible measures of countries' characteristics, including institutional aspects, that may explain this effect. It is possible, for example, that factors *other* than the degree of informational opaqueness and the protection of property rights can explain both a low level of effective competition and why limited competition hurts access to financing. Although this type of omitted variable problem is reduced given our specification, we cannot eliminate the possibility that omitted variables drive some of the results. Nevertheless, our results shed some important light on how competition can affect access to external financing.

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Appendix Table I: Country -Averages of the Main Regression Variables.

| Country | Growth | Total capitalization | Concentration | Competition |
|--------------|---------|----------------------|---------------|-------------|
| Australia | 0.0222 | 0.6606 | 0.60 | 0.80 |
| Austria | 0.0394 | 0.7943 | 0.42 | 0.81 |
| Bangladesh | 0.0492 | 0.0704 | 0.62 | |
| Belgium | -0.0018 | 0.3805 | 0.49 | |
| Brazil | 0.0373 | 0.2783 | 0.40 | |
| Canada | 0.0283 | 0.9056 | 0.57 | 0.62 |
| Chile | 0.0576 | 0.7013 | 0.45 | |
| Colombia | 0.0345 | 0.1965 | 0.35 | |
| Costa Rica | 0.0593 | 0.2961 | 0.71 | |
| Denmark | 0.0205 | 0.5060 | 0.74 | |
| Egypt | 0.0952 | 0.2197 | 0.58 | 0.46 |
| Finland | 0.0238 | 0.5419 | 0.85 | |
| France | 0.0236 | 0.6435 | 0.28 | |
| Germany | 0.0379 | 0.8734 | 0.27 | 0.81 |
| Greece | 0.0178 | 0.5162 | 0.79 | |
| India | 0.0684 | 0.2927 | 0.40 | 0.61 |
| Israel | 0.0219 | 1.0183 | 0.79 | |
| Italy | 0.0072 | 0.4877 | 0.24 | |
| Japan | 0.0652 | 1.1581 | 0.21 | |
| Jordan | 0.0839 | 1.0384 | 0.87 | |
| Kenya | 0.0183 | 0.2044 | 0.59 | |
| Korea | 0.1347 | 0.5753 | 0.28 | |
| Malaysia | 0.0937 | 1.1386 | 0.44 | 0.84 |
| Mexico | -0.0307 | 0.2324 | 0.53 | 0.75 |
| Morocco | 0.0846 | 0.1812 | 0.57 | |
| Netherlands | -0.0095 | 0.7969 | 0.77 | 1.01 |
| New Zealand | 0.0239 | 0.5186 | 0.75 | |
| Norway | -0.0010 | 0.4011 | 0.60 | 0.91 |
| Pakistan | 0.0738 | 0.2802 | 0.71 | 0.61 |
| Peru | -0.0341 | 0.1658 | 0.64 | 0.53 |
| Philippines | -0.0077 | 0.3780 | 0.40 | |
| Portugal | 0.0127 | 0.5259 | 0.46 | |
| Singapore | 0.0857 | 2.1903 | 0.61 | 0.56 |
| South Africa | 0.0176 | 1.4629 | 0.69 | |
| Spain | 0.0169 | 0.8480 | 0.34 | |
| Sri Lanka | -0.0221 | 0.2718 | 0.75 | |
| Sweden | 0.0138 | 0.5261 | 0.71 | 0.82 |
| Turkey | 0.1194 | 0.1499 | 0.41 | |
| U.K. | 0.0105 | 0.6296 | 0.50 | 0.65 |
| Venezuela | -0.0228 | 0.3512 | 0.47 | 0.69 |
| Zimbabwe | 0.0196 | 0.7489 | 0.78 | |
| Total | 0.0349 | 0.5803 | 0.55 | 0.72 |

Notes: Growth is real growth in sectoral value added for the period 1980—1990. Total capitalization is private credit plus stock market capitalization to GDP in 1980. Concentration is the three-bank concentration ratio for the period 1989—1996. Competition is the average *H*-statistic for the period 1987—1996. Definitions and data sources of the variables are in Table 1.

Appendix Table II: H -statistic estimates and statistical significance.

| Country | H -statistic | St. dev. of H - statistic | p -value of test with $H_0: H=1$ | p -value of test with $H_0: H=0$ | Rank order of H - statistic |
|-------------|----------------|--------------------------------|---------------------------------------|---------------------------------------|----------------------------------|
| Egypt | 0.46 | 0.05 | 0.00 | 0.00 | 1 |
| Peru | 0.53 | 0.12 | 0.00 | 0.00 | 2 |
| Singapore | 0.56 | 0.04 | 0.00 | 0.00 | 3 |
| India | 0.61 | 0.04 | 0.00 | 0.00 | 4 |
| Pakistan | 0.61 | 0.10 | 0.00 | 0.00 | 5 |
| Canada | 0.62 | 0.04 | 0.00 | 0.00 | 6 |
| U.K. | 0.65 | 0.06 | 0.00 | 0.00 | 7 |
| Venezuela | 0.69 | 0.09 | 0.00 | 0.00 | 8 |
| Mexico | 0.75 | 0.04 | 0.00 | 0.00 | 9 |
| Australia | 0.80 | 0.05 | 0.00 | 0.00 | 10 |
| Austria | 0.81 | 0.04 | 0.00 | 0.00 | 11 |
| Germany | 0.81 | 0.04 | 0.00 | 0.00 | 12 |
| Sweden | 0.82 | 0.02 | 0.00 | 0.00 | 13 |
| Malaysia | 0.84 | 0.02 | 0.00 | 0.00 | 14 |
| Norway | 0.91 | 0.05 | 0.04 | 0.00 | 15 |
| Netherlands | 1.01 | 0.05 | 0.82 | 0.00 | 16 |
| Average | 0.72 | 0.06 | 0.05 | 0.00 | |

Appendix Table III: Stability of H -statistic

| Country | H (1987—1996) | H1 (1987-1991) | H2 (1992-1996) |
|-------------|---------------|----------------|----------------|
| Australia | 0.80 | 0.75 | 0.83 |
| Austria | 0.81 | | |
| Canada | 0.62 | 0.63 | 0.62 |
| Egypt | 0.46 | | 0.44 |
| Germany | 0.81 | 0.89 | 0.81 |
| India | 0.61 | 0.59 | 0.60 |
| Malaysia | 0.84 | 0.74 | 0.86 |
| Mexico | 0.75 | 0.70 | 0.71 |
| Netherlands | 1.01 | | 1.01 |
| Norway | 0.91 | 0.92 | 0.92 |
| Pakistan | 0.61 | | 0.61 |
| Peru | 0.53 | | 0.52 |
| Singapore | 0.56 | | 0.55 |
| Sweden | 0.82 | | 0.80 |
| UK | 0.65 | | 0.66 |
| Venezuela | 0.69 | 0.78 | 0.67 |
| Total | 0.72 | 0.75 | 0.71 |

Notes: H is the average H -statistic for the period 1987—1996, H1 is the average H -statistic for the period 1987—1991, and H2 is the average H -statistic for the period 1992—1996. We estimate the H -statistic only for countries and periods that have more than 20 country-year observations.