Competition in the Financial Sector and Growth:

A Cross-Country Perspective

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November 2003

Abstract: The importance of competition in the financial sector has long been recognized although few formal empirical studies exist. The relationship between competition and access of firms to external financing and associated economic growth is ambiguous in theory. In this paper, we relate a competition measure to industrial growth for 29 banking systems. We find that the effects of competition on access to financing (and growth) can depend on the level of development of the financial system. Specifically, in countries with less developed financial systems financially dependent industries grow faster when the financial system is less competitive while in more developed financial systems, more competition is associated with higher growth.

INTRODUCTION

Competition in the financial sector 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 financial services. Also, again as in other industries, it can affect the quality of financial products and the degree of innovation in the sector. Specific to the financial sector is the link between competition and stability that has long been recognized in theoretical and empirical research and, most importantly, in the actual conduct of prudential policy towards banks. Importantly, it has also been shown, theoretically as well as empirically, that the degree of competition in the financial sector can effect the access of firms and households to financial services and external financing. The direction of the latter relationship is, however, unclear. Less competitive systems may lead to more access to external financing since banks are more inclined to invest in information acquisition and relationships with borrowers. When banking systems are less competitive, however, hold-up problems may lead borrowers to be less willing to enter such relationships. Furthermore, less competitive banking systems can be more costly and exhibit a lower quality of services thus providing less financing and encouraging less growth. These effects may further vary by the degree of a country's financial sector development.

Although some of these relationships between competition and banking system performance have been analyzed in the theoretical literature and in some country studies, cross-country empirical research on the issue of and effects of competition in banking systems is still at an early stage. While there have been a number of recent cross-country studies on the effects of banking structure on stability, access to financing and growth, the interpretation of this empirical

work is not always clear since 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, ownership structures, such as the degree of foreign or state ownership). Rather, testing for the degree of effective competition needs a structural, contestability approach. To date, however, most papers have not investigated the degree of competition in the banking system using a specific structural model. As such, the results on the effect of market structure on banking system performance, firm financing and growth could reflect factors other than competition. Furthermore, there have been rapid changes in financial services industries world-wide, such as increased substitutability among various types of financial services, more inter-industry competition, greater securitization and larger use of capital markets' instruments and rapid deregulation, making the structure of banking markets a potentially less relevant measure of market conduct.

A more industrial organization based approach to assessing the degree of competition in the financial sector allows one to overcome the concerns raised by the contestability literature. An additional measure will also allow a comparison of results to other approaches of measuring the impact of competition using banking system structures. In an earlier paper, Claessens and Laeven (2003), applied such a structural competition test (the Panzar-Rosse (1987) methodology) to 50 countries' banking systems. In addition to documenting this measure of competition for a large cross-section of countries, the market structure, the role of entry and activity regulations and the role of foreign banks in affecting the competitive conditions of banking systems were analyzed. The finding was that besides the share of foreign banks,

measures of banking system structure did not provide any indication of markets' competitiveness, at not as expected (we actually found that more concentrated system were more competitive). In this paper, this measure of the degree of competition in countries' banking systems to economic growth is related. One manner of clarifying the theoretically ambiguous relationships between banking system competition and the provision of external financing is by investigating how the degree of competition affects the growth in value added of sectors that vary in their external financial dependence. This can be done using the empirical set up developed by Rajan and Zingales (1998, RZ hereafter). RZ assesses the relationship between financial development and growth using sectoral growth data for a large sample of countries. This methodology has been used in a number of tests, for example, to assess the impact of banking system concentration, the development of trade finance and the strength of property rights on industrial growth.[1] This paper further adopts the methodology to explore the relationships between banking system competition and growth.

We find that our competitiveness measure is negatively associated with countries' growth, suggesting that less competitive banking systems are better at providing financing to financially dependent firms. We find evidence, however, that the effects of banking system competitiveness on growth vary with the level of countries' financial sector development. In particular, we find that in only countries with less developed financial systems do financially dependent industries grow faster if the financial system is less competitive while in more developed financial systems they grow faster when the financial system is more competitive. Our findings suggest that the

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[1] Other papers that use this approach, among others, include 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 on growth, to mention a few.

trade-off between competition and firm access to external financing arises only in financially less developed countries; in these countries, less competition may be desirable since this leads banks to provide more financing to informationally more opaque borrowers. Yet, in more developed financial systems, more competition may allow for more growth.

The results come with some caveats. We did not control for all other factors that have been found to affect financial sector development. Our results may, for example, capture the fact that less developed financial systems have worse property rights, making it harder to lend if competition is high, or that less developed financial markets are informationally more opaque. While less competition may then be a second best response to enhancing access to firm external financing, the first best response may be to improve property rights and transparency while allowing for more competition. Furthermore, it might be the case that some market power increases financial stability although this effect is not necessarily captured in the industrial growth measure we use since our sample is relatively short. Regardless, the results suggest that competition policy in the financial sector is complicated and can not be evaluated independently from the overall development of the financial system.

In this paper, Section 1 provides a review of related literature on the theoretical effects of competition in the financial sector, on measuring competition in general and in the financial sector specifically and on the effects of market structure on economic outcomes. In Section 2, the methodology used to measure the degree of competition in the banking market of a particular country and the empirical setup we use for the growth regressions is discussed and the data used

in this paper is presented. The main empirical results regarding banking system competition and industrial growth are provided in Section 3. The conclusions are presented in Section 4.

1.   LITERATURE REVIEW

Several, related strands of literature are reviewed here. To begin, a short review of the growing theoretical literature on the effects of competition in the financial sector is presented. Next, we briefly review the general theory on measuring competition and examine some of the empirical papers that have applied structural competition tests to the financial sector. Finally, we review the empirical literature that has investigated the relationships between structural and regulatory factors and performance and access to financing and growth, all as they relate to the (competitive) structure of the banking systems, although these papers have mostly not attempted to test a specific structural competition model.

1.1   Theory on Effects of Competition in Finance

As a first-order effect, one would expect increased competition in the financial sector to lead to lower costs and enhanced efficiency of financial intermediation, greater product innovation and improved quality.   One channel of how one could expect more competitive banking systems to be associated with higher growth is that competition leads to lower costs of financial intermediation, similar to other industries. This could be expected even though financial services have some special properties. In a theoretical model, Besanko and Thakor (1992), for example, analyze the allocational consequences of the relaxing of entry barriers and find, even allowing for the fact that financial products are heterogeneous, that equilibrium loan rates decline and

deposit interest rates increase, even when allowing for differentiated competition. In turn, by lowering the costs of financial intermediation and thus lowering the cost of capital for non-financial firms, more competitive banking systems would lead to higher growth rates.

Recent research, however, has highlighted that the relationships between competition and banking system performance, access to financing, technology and growth are more complex. Market power in banking may be, to a degree, beneficial for access to financing. A bank and a borrower establish relationships to overcome information problems and to facilitate lending over time; charging lower rates initially, when firms are young and risky, and higher rates later, when firms are less risky, to recover costs. The higher its market power, the more likely the bank invests in information gathering about firms, especially to informationally opaque firms, and the more likely it provides credit (Rajan, 1992). Indeed, Petersen and Rajan (1995) find, for the United States, that loan rates are lower for young firms and higher for old firms in more concentrated banking markets than for comparable firms in more competitive markets. Importantly, they also find a greater availability of credit for firms in more concentrated markets. The implication is that more competition can undermine the incentives of banks to invest in a relationship. As banking markets are deregulated and become more competitive, that would imply that access to financing could decline.

Yet, such a relationship between a bank and a borrower involves sunk costs and leads to a hold-up problem: the incumbent bank has more information about the borrower than its competitors do. This increases the switching costs for the borrower, especially for better quality borrowers, since they will face adverse conditions when trying to look for financing from

another bank (i.e., they will be perceived as a poor credit). Borrowers will be more willing to enter a relationship with a bank if they are less likely to be subject to a hold-up problem, for example, when the market for external financing is more competitive. As such, more competitive markets may see greater access. On the bank side, if faced with a less competitive market, the bank may have less of an incentive to make an (or additional) investment in a relationship as the bank knows that the borrower is (more) captive anyway. With less investment in information acquisition, the supply of loans may be less with less competitive markets. The net effect of these hold-up and other problems is that the degree of lending by banks can rather increase with the overall competitive environment. Boot and Thakor (2000) show, for example, that increased interbank competition may induce banks to make not less but more relationship loans. There can also be effects from the type of information problem back to the scope for potential competition; that is, competition may be endogenous. Dell'Ariccia, Friedman and Marquez (1999), for example, show that the presence of information asymmetries in lending relationships can become a barrier to entry in the banking system.

These benefits and gains from closer bank-firm relationships and less competition can relate to the general development of the financial system and the economic benefits of internal financial markets (among firms) compared to external financial markets. The benefits and gains of internal markets have been discussed as far back as Coase (1960) and more recently by Williamson (1985). They highlight the role organizations play in reducing transaction costs in various markets. This also applies to financial markets. In particular, when frictions in financial markets are severe, internal financial markets and close relationships can provide benefits in allocating capital more efficiently (Stein, 1997). This role of internal markets can include

providing funds to firms that have growth potential but which are financially constrained or in temporary financial distress. One can expect these types of internal markets and informal relationships to be more important when countries and their financial systems are less developed. For more developed countries, external financial markets are more important thus making it more important to have a more developed financial system. This, in turn, suggests that the effects of competition in the financial system can vary by a country's financial sector development.

Another channel where competition could be expected to be important for financial services provision would be through the acquisition of technology, thereby increasing the access to and improving the terms of external financing. On one hand, with less competitive market structures, banks might be more willing to invest in technology which, in turn, can help extend the set of borrowers against which banks can lend. On the other hand, technological progress can increase competition from other banks and non-bank financial institutions by lowering production or distribution costs for all financial services providers. With a more competitive structure of existing markets, incumbent financial services providers may be more inclined to invest in technological progress to maintain market share. Again, the net of these effects is unclear. Endogenizing competition, Hauswald and Marquez (2002), for example, analyze the impact of technological progress on competition in financial services. While better information technology may lead to improved information processing and lower costs of financial intermediation, it may also lead to lower costs of information or even free access to information. Better access to information can decrease interest rates, however, Hauswald and Marquez (2002) show that an improved ability to process information can increase interest rates. The net effects

on lending rates and access to financing hinge on the overall effect ascribed to technological progress and the existing market structures.

Technological progress can also affect market structures. Marquez (2002) analyzes how information generated through the process of lending can impact the structure of the banking industry to the extent that this information is proprietary to the banks. He shows that, in markets where new entrants have specific expertise in evaluating credit risks or in markets with high borrower turnover, entry should be easier so that incumbents' bank information advantages are reduced. Again, the preferred market structure in terms of access may depend upon the degree of information asymmetries and the ownership and control structures for information.

Apart from its effects on access, terms of financing and market structures, the relationships between competition and stability are not obvious. Many academics and especially policy makers have stressed the importance of franchise value for banks in maintaining incentives for prudent behavior. In turn, this has led banking system regulators to carefully balance entry and exit. This has often been, however, a static view. Perotti and Suarez (2002), for example, draw attention to the importance of the dynamic pattern of entry and exit regulation in driving current actions of banks. They show in a formal model that the behavior of banks today will be affected by both current and future concentration and the degree to which authorities will allow for a contestable system in the future. In a dynamic model, current concentration does not necessarily reduce risky lending but an expected increase in future market concentration can make banks choose to pursue safer lending today. More generally, there may not be a tradeoff between stability and increased competition, in contrast what is often argued by

many policy makers. This has been shown, among others, by Allen and Gale (2000) and reviewed recently by Allen and Gale (2003). Furthermore, Allen and Gale (1998) show that banking system crises, possibly related to the degree of competition, are not necessarily harmful for growth.

In the end, the view that competition in banking is unambiguously good for growth is more naive than in other industries and vigorous rivalry may not be the first-best for financial sector performance. (For a recent, broader review of the theoretical literature on competition and banking see Vives 2001). Deregulation and technological progress would not necessarily improve financial sector competitiveness and lead to more or better access to external financing and more growth. Nor would a more restrictive competition environment necessarily lead to more financial system stability and growth. Regardless of these theoretical ambiguities on the effects of competition on financial sector functioning, one needs a measure of the effective degree of competition in a banking system to empirically analyze the validity of any of these theoretical predictions. Therefore, we next review the general theory on empirical testing for competition and its application to banking. We then review the empirical literature on the relationship between market structure and economic outcomes although the papers may not use the measure of competition suggested by the industrial organization literature to assess these effects.

1.3   Competition Testing: Theory and Empirical Results for Banking Systems

The general contestability literature has suggested specific ways on how to go about testing for

the degree of competition. Klein (1971), Baumol, Panzar, and Willig (1982) were the first to

develop a formal theory of contestable markets. They draw attention to the fact that there are

several sets of conditions that can yield competitive outcomes, even in concentrated systems.

Conversely, they showed that collusive actions could be sustained even in the presence of many

firms. Their work has spanned a large empirical literature covering many industries.

        Two types of empirical tests for competition can be distinguished since they have been

applied to financial sector (and other industries). The model of Bresnahan (1982) and Lau

(1982), as expanded in Bresnahan (1989), uses the condition of general market equilibrium. The

basic idea is that profit-maximizing firms in equilibrium will choose prices and quantities such

that marginal costs equal their (perceived) marginal revenue, which coincides with the demand

price under perfect competition or with the industry's marginal revenue under perfect collusion.

The alternative approach is Rosse and Panzar (1977), expanded by Panzar and Rosse (1982) and

Panzar and Rosse (1987). This methodology uses firm (or bank)-level data. It investigates the

extent to which a change in factor input prices is reflected in (equilibrium) revenues earned by a

specific bank. 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, consequently, reduce

total revenues.

A number of papers have applied either the Breshnahan or the PR methodology to the issue of competition in the financial sector, although mostly specific to the banking system.[2] One of the first papers using the Breshnahan methodology for banks is Shaffer (1989). He applies the methodology to a sample of U.S. banks and finds results that strongly reject collusive conduct but are consistent with perfect competition. Using the same model, Shaffer (1993) studies the competition conditions in Canada and finds that the Canadian banking system was competitive over the period 1965-1989 although being relatively concentrated. He also finds that the degree of competition in Canada was generally stable following regulatory changes in 1980. Gruben and McComb (forthcoming) applied the Breshnahan methodology to Mexico before 1995 and find that the Mexican banking system was super-competitive; that is, marginal prices were set below marginal costs. One of the few studies that uses the Breshnahan model with a relatively large sample of countries is Shaffer (2001). For 15 countries in North America, Europe, and Asia during 1979-91, he finds significant market power in five markets and excess capacity in one market. Estimates were consistent with either contestability or Cournot type oligopoly in most of these countries, while five countries were significantly more competitive than Cournot. Since the data refer to the period before the European single banking license was adopted, the result may, however, not be reflective of the current situation.

Shaffer (1982) was also 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 using the PR methodology. The results for Canada are consistent with the results of Shaffer (1989) using the Breshnahan methodology in that they can

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

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also reject monopoly power for the Canadian banking system. (Nathan and Neave found perfect competition for 1982 and monopolistic competition for 1983-84.) Some other studies have applied the PR methodology to some non-North America and non-European banking systems. For Japan, for example, Molyneux, Thornton and Lloyd-Williams (1996) find evidence of a monopoly situation in 1986-1988.

A number of papers have applied the PR methodology to European banking systems. These papers include Molyneux, Lloyd-Williams, and Thornton (1994), Vesala (1995), Molyneux, Thornton and Lloyd-Williams (1996), Coccorese (1998), Bikker and Groeneveld (2000), Bikker and Haaf (2001), De Bandt and Davis (2000) and Hempel (2002).   The countries covered, the time periods and some of the assumptions used vary between the studies. Although the findings varied somewhat, generally, the papers can reject both perfect collusion as well as perfect competition and mostly find evidence of monopolistic competition. (Bikker and Haaf (2001) summarize the results of some ten studies.)   Bikker and Groeneveld (2000), for example, find monopolistic competition in all of the 15 EU-countries they study.

To date, tests on the competitiveness of banking systems for developing countries and transition economies using these models are few. Using the PR-approach, Belaisch (2003) finds evidence of a non-monopolistic market structure in Brazil.   Gelos and Roldos (2002) analyze a number of banking markets using the PR-methodology, 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, appeared to

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have prevented a decline in competitive pressures associated with consolidation. Levy ,Yeyati and Micco (2003) find similar results using the PR-methodology for their sample of Latin America countries and find that the process of consolidation in the 1990s, if anything, may have led to more, rather than less, competition. Philippatos and Yildirim (2002) investigate 14 Central and Eastern European banking systems using bank-level data and the PR-methodology. They find, except for Latvia, Macedonia, and Lithuania, that these banking systems can neither be characterized as perfectly competitive nor monopolistic. They also conclude that large banks in transition economies operate in a relatively more competitive environment compared to small banks.

A broad cross-country study using the PR methodology is Claessens and Laeven (2003). Using bank-level data, they estimate the extent to which changes in input prices are reflected in revenues earned by specific banks in 50 countries' banking systems. They then relate this competitiveness measure to indicators of countries' banking system structures and regulatory regimes. They find systems with greater foreign bank entry, and fewer entry and activity restrictions to be more competitive. Importantly, and consistent with some of the other studies, they find no evidence that their competitiveness measure negatively relates to banking system concentration or number of banks in the market. Their findings suggest that measures of markets structures do not translate in measure of effective competition, consistent with contestability determining effective competition.

Differences between assessments of the competitiveness of banking systems using the Breshnahan and the PR methodologies appear small, as already noted for Canada. In a broad

comparison, Bikker and Haaf (2001) use the PR model and the Breshanan model, with the latter applied to the market for deposit and loan facilities. They first apply the PR model to 17 European and six non-European (US, Japan, Korea, New Zealand and Canada) markets. They reject both perfect competition and perfect cartel for all markets when including all banks, but cannot reject perfect collusion for Australia and Greece when analyzing only small banks. They find some evidence that smaller banks operate in less competitive environments than larger banks do, suggesting that local markets are less competitive than national or international markets are. They also find that in general, competition appears to be less in non-European countries. Using the Breshanan model for nine EU-countries in their sample of 17 EU-countries, they find that the markets for deposit and loan facilities are probably highly competitive, a result in line with their results of the PR model, suggesting that the two methodologies lead to similar assessments.

Empirical competition tests using other than the Breshanan and PR models have also been conducted, although few so far. Kessidis (1991) has developed a model of contestability which focuses on sunk costs. A recent study using this model on the EU-banking markets is Corvoisier and Gropp (2002). They focus on the effects of advances in information technology, given its effects on sunk costs, on competition. They find evidence for an increase in contestability in deposit markets and more moderate effects for loans markets, which they conjecture is because technology has reduced sunk costs more in deposit than in loan markets.

1.2   General Empirical Studies on the Effects of Banking System Structure on Banking

       System Performance and Economic Growth

A number of papers have investigated the effects of market structure, as presumed to relate to

competitive conditions in banking systems. The focus of these papers has been varied, but has

included trying to establish the impact of competition (or lack thereof) on bank efficiency, firm

access to financing, stability and growth. While many of these papers are not formal structure-

performance-conduct tests, their results have been interpreted as indicative of the degree of

competition and/or its causes and consequences in the financial sector.

       For the U.S. and some other markets, there is some empirical evidence regarding the

effects of concentration in the financial system on access to and costs of external financing and

growth. For the U.S., Petersen and Rajan (1995) offer empirical evidence that firms are less

credit constrained and face cheaper credit the more concentrated the credit market is. Collender

and Shaffer (2001) document how in the U.S., non-metropolitan employment grew faster in areas

where there was a more concentrated initial banking structure and where there were locally

owned bank offices. Degryse and Ongena (2002) show in the case of Belgium that loan rates

increase in the distance between the firm and competing banks and decrease in the distance from

the lender and the firm, suggesting that increased distance relaxes price competition.

       In many countries, changes in market structures have been driven by consolidation. The

effect of consolidation on bank lending terms and access has been a much-researched topic and

is too large a literature to review here. (Gilbert (1984) reviews the earlier studies, while Berger, Demsetz, and Strahan (1999) review more recent studies on the effects of consolidation, mainly for the U.S.) A very recent, but more policy-oriented review on the effects of consolidation is G-10 (2001). It concluded that higher concentration in banking markets may lead to less favorable conditions for consumers, especially in markets for small business loans, retail deposits and payment services, but results were weaker for the 1990s than for the previous decade. It also mentioned that studies on small business lending for Italy and the U.S. suggest that banks reduce the percentage of their portfolio invested in small business loans after consolidation. Other banks and new entrants, however, tend to offset the reduction in the supply of credit, in both the U.S. and Italy, although for Italy a shift away from the worst borrowers did exist.

More recently, technological progress and its effects on the banking industry have been much researched. Berger (2002) reviews this literature and finds improvements in costs and lending capacity as well as consumer benefits. The research also suggests significant overall productivity increases in terms of improved quality and variety of banking services and it appears that technological progress may have helped facilitate consolidation. The effects of technology on access are unclear. Research suggests that banks have been able to make small business loans at greater distances (Petersen and Rajan, 1995) and that affiliate banks suffered fewer profit and cost diseconomies associated with the distance to headquarters in recent years. At the same time, there is some evidence that, in part due to technology and more formal internal management, banks have relied less on soft information, making for less access to financing by small firms (Berger, Miller, Petersen, Rajan, and Scharfstein, 2002).

Many of these studies pertain to developed countries and are mostly not of a cross-country nature. There are a number of papers, however, investigating across countries the effects of specific structures or other factors presumed to relate to the competitive environment on banking performance. Claessens, Demirgüç-Kunt and Huizinga (2001) investigate the role of foreign banks in a cross-country study and show that entry by foreign banks makes domestic banking systems more efficient by reducing their margins. There is also ample evidence indicating that those countries with a larger share of state ownership in banking experience worse outcomes on average. Barth Caprio and Levine (2003) and La Porta, Lopez-de-Silanes, and Shleifer (2002) find uniformly negative results for the impact of state ownership on overall banking sector development and banking sector efficiency. Berger, Hasan and Klapper (2003) investigate the effects of community banks on growth in 49 nations for 1993-2000. They find that greater market shares and efficiency ranks of small, private, domestically-owned banks are associated with better economic performance, and that the marginal benefits of higher shares are greater when the banks are more efficient. Only mixed support is found for improved financing for SMEs or greater overall bank credit flows.

These cross-country studies on structure have been complemented with studies on regulations governing entry and exit rules for banking systems. In a broad survey of rules governing banking systems, Barth, Caprio and Levine (2001) document for 107 countries various regulatory restrictions in place in 1999 (or around that time) on commercial banks, including various entry and exit restrictions and practices. Using this data, Barth, Caprio and Levine (2003), among others, empirically investigate the cost and benefits of these restrictions. They find that tighter entry requirements are negatively linked with bank efficiency, leading to higher

interest rate margins and overhead expenditures, while restricting foreign bank participation tends to increase bank fragility. These results are consistent with the view that tighter entry restrictions tend to limit competition and emphasize that it is not the actual level of foreign presence or bank concentration, but the contestability of a market that is positively linked with bank efficiency and stability.

Additionally, a number of recent studies have investigated the combined impact of structure and regulations. Using bank level data for 77 countries, Demirgüç-Kunt, Laeven, and Levine (2003) investigate the impact of bank concentration and regulations on bank efficiency. They find that bank concentration has a negative and significant effect on the efficiency of the banking system except in rich countries with well-developed financial systems and more economic freedoms. Furthermore, they find empirical support using bank-level data that regulatory restrictions on entry of the new banks, particularly concerning foreign banks, and implicit and explicit restrictions on bank activities, are associated with lower levels of bank efficiency. Also using a cross-country approach, but with firm-level data, Beck, Demirgüç-Kunt and Maksimovic (2002) investigate the effects of bank competition on firm financing constraints and access to credit. They find that bank concentration increases financing constraints and decreases the likelihood of receiving bank financing for small and medium-size firms, but not for large firms. The relation of bank concentration and financing constraints is reduced in countries with an efficient legal system, good property rights protection, less corruption, better developed credit registries and a larger market share of foreign banks, while a greater extent of public bank ownership exacerbates the relation. Further, a lower degree of contestability and restrictions on banks' activities exacerbate the relation, while high entry and capital requirements alleviate it.

Some papers have analyzed the relationship between banking concentration and banking crises. Beck, Demirguc-Kunt and Levine (2002), for example, show, using data on 79 countries over the period 1980-1997, that crises are less likely (i) in more concentrated banking systems, (ii) in countries with fewer regulatory restrictions on bank competition and activities, and (iii) in economies with better institutions; i.e., institutions that encourage more competition and support private property rights. If there is a link between banking crisis and growth, this could imply that more concentrated banking systems have higher growth.

Finally, there have been a number of cross-country papers studying the impact of banking system structure on growth. Using the empirical methodology of Rajan and Zingales (1998), Cetorelli and Gambera (2001) document, in a cross-section study, that banking sector concentration exerts a depressing effect on overall economic growth, though it promotes the growth of industries that depend heavily on external finance. Using the same data and similar methodology, Deiida and Fatouh (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 (forthcoming) also employ this approach and find that bank competition 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 bank competition on firm credit, consistent with theories that competition 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 less strong in countries with well-developed financial systems. Finally, using a different approach, Eschenbach and Francois (2002) investigate, using a dynamic, simultaneous system approach, the relationship between financial sector openness, competition and growth. Using a panel estimation of 130 countries, they report a strong relationship between financial sector competition/performance and financial sector openness and between growth and financial sector openness/competition. They also find evidence of the presence of economies of scale in the financial sector.

2.   METHODOLOGY AND DATA

We are interested in studying the effects of banking system competition on growth. As indicated in the review, theoretical work suggests an ambiguous relationship between degree of competition and access to financing and, in turn, growth. While existing empirical work has shown some relationships between market structure and growth, the link from structure to degree of competition is not clear. Thus, to properly investigate the effects of competition on growth we need to use a good measure of competition. Furthermore, we need to control for other country circumstances, which may be correlated with competition but that, in effect, determine the growth effects. Otherwise, the incorrect conclusion that competition is (or is not) important could be reached. Therefore, for our empirical tests on the effects of competition in the banking system on economic growth, we use the setup of Rajan and Zingales (1998, RZ hereafter), which has been used in a number of tests, some of which have been reviewed above.

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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 argument of RZ is that financially dependent firms can be expected to grow more in countries with a higher level of financial development. RZ uses U.S. firm data as proxies at the industry level to derive the typical external dependence for a particular industrial sector. Their presumption is that the well-developed financial markets in the U.S. should allow U.S. firms to achieve the desired financing for their respective industrial sector. This approach offers a way to identify the desired extent of external dependence anywhere in the world.[3] In their regressions, RZ also include the industry's market share in total manufacturing in the specific country to control for differences in growth potential across industries. Industries with large market shares may have less growth potential than industries with small initial market shares when there is an industry-specific convergence. 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. Finally, RZ use country and industry dummies to control for country-specific and industry-specific factors.

The innovation of the RZ approach is that it overcomes some of the identification problems encountered in standard cross-country growth regressions. It does this by interacting a country characteristic (financial development of a particular country) with the external financial

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[3] 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 as 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 others do, 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

dependence of a particular industry. This approach is less subject to criticism regarding an omitted variable bias or model specification than traditional approaches that relate financial sector development directly to economic growth, even when considering other country characteristics. It allows them to isolate the impact of financial development on growth. Furthermore, in addition to including country indicators and industry indicators, they explicitly conduct tests for the importance of 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.

The results of RZ provide support for the importance of financial system development for growth. We expand the RZ model to test for the effect of competition in the banking system on growth and the specific channels through which competition policy may affect growth. Specifically, we add to their model a variable capturing the degree of competitiveness of the country's banking system interacted with variables of financial dependence and financial sector development as well as entering the competitiveness measure directly. We do this in two different set of regressions, one with country dummies and one with country control variables.

First variable is the interaction of each industrial sector's external financing dependence and the index of the degree of competition in banking system of the country. With this interaction variable, we test whether industrial sectors that typically use more external financing grow faster (slower) in countries with less (more) competition in their banking systems. As noted, the theoretical prediction of this effect is unclear. On one hand, if more competitive

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allowed to differ between countries. The model only assumes the rank order of optimal external financing needs across industries to be similar across countries.

banking systems channel less financing to firms, as they have less incentives to invest in relationships with firms, then especially those firms and sectors heavily dependent on external financing should grow slower. If, conversely, more competitive banking systems lead to more access—as the hold-up problems are less or as firms are more willing to enter relationships— then especially those firms heavily dependent on external financing should grow faster. The test of whether external financially-dependent sectors grow faster (slower) in countries with less (greater) competition, then provides evidence that the less (more) banking system competition positively (negatively) affects firms' ability to attract financing and, consequently, through that channel, growth.

Second, we explore whether the effects of banking system competitiveness differ by the development of the country's financial system. As noted, the argument has often been made that less developed countries benefit more from closer bank-firm relationships and, indeed, some papers have found some support for this argument. We use the size of the banking system as our measure of financial development. We then create a triple interaction variable by interacting the competitiveness measures with both the size of the country's banking system and each industrial sector's external financing dependence. If smaller, less competitive banking systems function relatively better in providing financing to financially dependent firms, than the coefficient for this triple interaction variable would be positive. Additionally, if more competitive banking systems function better when the financial sector is smaller, then this variable would be negative. Analyzing the signs and magnitudes of the coefficients for the first and second interactive variables will then provide an indication of the effects of competition for financially dependent firms by degree of financial sector development.

Third, the effects of the degree of competition in the banking system need not go through the financing angle only. Competitiveness can be important because it leads to a better general development of the banking system in terms of allocating resources, providing new or better quality financial instruments and having lower costs of financial intermediation. If so, then the effects on industrial growth of the degree of competition in the banking system would not need to differ by the degree of the firm's external financial dependence. Some papers have found, however, that the effects of banking system structure (and possibly competition) can vary by the level of development of the country, with well-developed countries, for example, less affected by banking system concentration. Therefore, in a separate set of regressions, we test for the importance of banking system competition by level of financial sector development through including an interaction variable between our measure of banking system competitiveness and the size of the banking system.

Fourth, it could be that the competitiveness of the banking system is an indicator of the development of the economy at large, rather than the functioning of the banking system specifically. Therefore, in some specifications, we also include the competitiveness measures directly, without any interactions. We also include other control variables that have been found to correlate with growth, which would help pick up the country, rather than banking system effect. Finally, we perform some robustness tests on the importance of controlling for country-specific factors and using instrumental variables to control for the possible (residual) endogeneity of some variables. As a sign of robustness, it is noteworthy that some of our specifications are similar to those of Cetorelli and Gambera (2001), Deiida and Fatouh (2002),

Dell'Ariccia and Bonaccorsi di Patti (forthcoming), except that they use banking sector

concentration as a measure of bank competition or structure.

3.2 Regression Specification and Data

The full specification for our regressions is as follows:

$$
\begin{aligned}
Growth_{jk} = Constant + &\Psi_1 \cdot Industry\ dummies_j \\
+ &\Psi_2 \cdot Country\ controls_k \\
+ &\Psi_3 \cdot Industry\ share\ of\ manufacturing\ value\ added_{jk} \\
+ &\Psi_4 \cdot External\ dependence_j \cdot Financial\ development_k \qquad (1) \\
+ &\Psi_5 \cdot External\ dependence_j \cdot Competition\ Index_k \\
+ &\Psi_6 \cdot External\ dependence_j \cdot Competition\ Index_k \cdot Financial\ development_k \\
+ &e_{j,k},
\end{aligned}
$$

where each industry is indicated by index j and each country by index k. Uppercase Greek letters

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.

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 and their sources. Most of

the variables are self-explanatory and have been used in other cross-country studies of firm

financing structures and firm growth. The industry dummies correct for industry-specific effects.

In the first set of regressions, we use country dummies to control for country differences. In the

second set of regressions, the vector of country control variables differs per specification, with

the exact vector of country control variables described in greater detail in the presentation of the

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specific empirical results. The vector can include the following variables: private credit-to-GDP, stock market capitalization-to-GDP, human capital, and the logarithm of per capita GDP.

As a measure of external financial dependence at the sectoral level, we use the data from RZ. RZ construct benchmark data on an industry basis assuming the external financing ratio, that is, the sectors' borrowing needs, for each industry in the U.S. to form a good benchmark. RZ calculate the external financial dependence ratios by industry using Compustat data on U.S. firms for the years 1980 to 1989, for firms less than 10 years old. We simply use their data for this measure. Also in line with RZ, we use the ratio of private credit-to-GDP, as provided by the World Development Indicators, as a proxy for financial development.

As our measure of the degree of competition in the banking system, we rely on Claessens and Laeven (2003, henceforth CL). CL used the Panzar and Rosse (1982, 1987) approach to assess the competitive nature of banking markets around the world. The Panzar and Rosse model provides a measure ("H-statistic") between 0 and 1 of the degree to which input prices are being passed on to output prices in the industry. This H statistic can be interpreted as follows. $H<0$ indicates a monopoly; $H=1$ indicates perfect competition; and $0<H<1$ indicates monopolistic competition.[4] CL derive the competitiveness measure using individual bank data for 1994-2001 for some 50 countries. As an alternative measure of countries' banking system competitiveness, we use the banking system concentration ratio (top 3 banks), in which case the specifications are identical to some of those used by Cetorelli and Gambera (2001).

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[4] The PR H statistics is calculated from reduced form bank revenue equations and measures the sum of the elasticities of the total revenue of the banks with respect to the bank's input prices. It can be shown, if the bank faces a demand with constant elasticity and a Cobb-Douglas technology, that the magnitude of H can be interpreted

We have data of value added from the UNIDO database. We use the growth in value added over the period 1980-1997, but for many countries the database is not complete. For some countries, data are not yet available for the latter part of the period, while some other countries did not have data for the beginning of the period (for example, some transition economies). Since we use all the data available to us, we therefore end up with a not perfect overlap in terms of periods of dependent and independent variables. Growth may, for example, refer to an earlier period than the competitiveness measure does. Since we always use the average rates of growth over the period available, however, the sample does remain balanced. The dataset of RZ includes some 45 countries. Since we have a different (larger) time period and we need to merge it with the countries for which we had the CL competitiveness measures, the number of countries included in our dataset drops somewhat and we end up with data on 30 countries. For the growth regressions, as in RZ, we need to drop the benchmark country, the United States, and we are therefore left with 29 countries.

Table 2 presents the summary statistics of the country-specific variables (the Annex presents the same statistics, but by individual country). The average sectoral growth real rate is 3%. The average sector requires some 31% of external financing for its investments. Private credit to GDP is on average some 38%, while the average competitiveness measure is 0.55, indicating that some form of monopolistic competition is the most typical of the 29 banking systems. We also provide the statistics for the interaction variables since those are useful for the comparison of some of the coefficients.

as an inverse measure of the degree of monopoly power, or alternatively, as CL do, as a measure of the degree of competition.

[Insert Table 2 here]

Table 3 provides the correlations among the variables. The 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 the convergence effects. As amply demonstrated, the degree of financial development tends to coincide with the overall level of development of a country. As shown by many as well, there is also a positive correlation between growth in value added and the size of private credit. This is further confirmed by the positive correlation for the interaction variable private credit times financial dependence.

Noteworthy for our analysis, there is a negative correlation between the growth in value added and the competitiveness measure. This suggests that less competitive systems may be better in providing financing. This is not, however, corroborated by the interaction variable since there the correlation coefficient is not statistically significant. This reduced importance of the competitiveness measure may be, in part, because there is a negative relation between the development of the financial system and its level of competitiveness; that is, countries with less developed financial systems have less competitive banking systems. The competitiveness measure and the concentration indexes are statistically significant positively correlated; that is, more concentrated systems are more competitive, in line with what CL have found and in contrast to the belief that more concentrated financial systems are less competitive. As such, analyzing the effects of competition and banking system structure on the level of external financing available and growth could be different exercises. Interestingly, both the concentration

and the competitiveness measures are negatively correlated with the private credit variable. All the interaction variables are closely correlated (not reported), as would be expected as the same sectoral financial dependence ratios are used, and the interaction variables are also positively correlated with the simple, non-interacted variables (also not reported).

[Insert Table 3 here]

3. EMPIRICAL RESULTS

The regression results are presented in this section. In all 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 1997 (to the extent data is available), with one observation per sector in each country. We first discuss the basic regression specifications, which are estimated using OLS and include country dummies. Industry dummies (not reported) are used in all regressions. The sample varies. In the first two regressions, without the competitiveness measure, we use 40 countries (to replicate the RZ result), while in the other regressions, when we use the competitiveness measure, we have only 29 countries. The results are presented in Table 4.

[Insert Table 4 here]

The industry's market share in total manufacturing in the specific country has a negative sign in all regressions, in line with RZ, suggesting that there is some industry-specific

convergence. 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 private credit-to-GDP times external financial dependence is positive and statistically significant (at the one percent level, column 1). Hence, and although we have a different data period and a somewhat different sample, consistent with the findings of RZ, we find that financial development facilitates economic growth through greater availability of external financing.

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 and the period covered. To compare the result for the banking system competitiveness variable, we next perform the first two regressions for 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 the more financially dependent sectors, while banking system concentration interacted with financial dependence is still negative, although not significantly related to growth.

In terms of our competitiveness measure, we find that industrial sectors using relatively more external financing develop faster in countries with less competitive banking systems since the coefficient for the interactive variable financial development times the competitiveness measure is statistically significant and negative (column 5). Hence, less competition in the

banking system facilitates economic growth as it leads to greater external financing availability. These results show that the view that market power is good for external financially dependent sectors is supported when a more complete measure of competition is used.

The competition effect on growth appears, however, not to be in addition to the increase in firm growth due to greater external financing availability. This is since, in the regressions where both the interaction variable of external financial dependence with the financial development and the interaction variable of the competitiveness variable with financial development are included, (column 6), only the financial development interactive variable is significantly positive. When also including the concentration interaction variable, the coefficients in the regressions on the concentration and the competitiveness measures are both not statistically significant (column 7). The coefficients on the private credit variable remain of similar magnitudes in regression 6 and 7 as in the earlier regressions (columns 1 and 3), supporting the robustness of this result. The fact that the interaction with the competitiveness variable is no longer significant may be because of the high correlations among the interacted variables. Although the interacted variables—external financial dependence variable interacted with the financial development measure and the external financial dependence measure interacted with the competitiveness index—intend to measure different concepts, the correlation between these variables is very high, 0.77.

As noted, the effects of the competitiveness of the banking system may depend upon the overall development of the system. Therefore, in the regression we also include a triple interaction between financial dependence, the competitiveness measure and the level of private credit to GDP (column 8). This regression leads to the following results: the interaction of

financial dependence with the development of the financial sector is no longer statistically significant, the interaction with the competitiveness measure is statistically significant negative and the triple interaction with the competitiveness measure and the private credit is statistically significant positive. Interestingly, the private credit variable interacted with financial dependence is no longer significant in this regression, suggesting that one may need to control for the degree of competitiveness relative to the size of the financial system in order to be able to evaluate the effect of financial sector development on growth.

To interpret all these results, we need to consider the size of the coefficients and the average for the private credit variables. The coefficient for the competitiveness interaction variable is –0.220, while the coefficient for the competitiveness and private credit interaction variable is 0.548. The average credit to GDP ratio is 0.379. Multiplying this with the 0.548 coefficient provides 0.21, or about the same as the negative coefficient on the competitiveness alone interaction, –0.220. This implies that for the average degree of financial sector development, the effect of the degree of competitiveness on growth is about zero. For financially less developed countries, the first interaction is quantitatively more important implying that less competition is better for firm growth for these countries. For more developed financial systems, the second interaction is quantitatively more important and, thus, competition appears to be better for growth of financially dependent firms.

To assess the economic significance of these results, we use the regression estimates to infer the differential impact of financial sector competition on growth of a financially dependent industry in two countries that differ in the level of their financial development. We consider a

financially dependent industry that has a score of 0.71 for the financial dependence index, which is exactly one standard deviation above the sample mean. Consider one country that has a well-developed financial system as measured by its level of private credit to GDP of 0.58, which is exactly one standard deviation above the sample mean, and the second country that has a low level of private credit to GDP of 0.18, which is one standard deviation below the sample mean. We now compare the differential impact of the level of financial sector competition on the growth of this industry in these two countries. We consider a high level of competition equal to one standard deviation above the sample mean and a low level of competition equal to one standard deviation below the sample mean of our competition variable. In the financially developed country, the financially dependent industry will grow at a rate of 1.5 percent per annum more if the country's financial sector is competitive rather than not competitive. Conversely, in the country with an underdeveloped financial sector, this industry will grow at a rate of 1.9 percent per annum more if the country's financial sector is not competitive. Compared to an average annual growth rate of 3 percent, these effects are economically significant.

We next conduct some robustness tests. Although the regression results so far all include country dummies, and thus control for any country differences besides the development and competitiveness of the banking system, our effects might still reflect country characteristics. Therefore, we want to control for some variables. In particular, we use some of the variables that have been found to be relatively robust explanatory factors of country growth: the general level of development, as proxied by GDP per capita; the degree of human capital, as proxied by average number of years of schooling; and the degree of development of the stock markets, as proxied by market capitalization to GDP. Furthermore, we directly include the measures of

financial sector development and competitiveness to investigate the first order effects of these factors. The results of the various regression specifications are in Table 5.

[Insert Table 5 here]

Columns 1 and 2 show that the key RZ finding is not altered when directly including the measure of financial sector development (as RZ showed as well), both for the larger and smaller sample. In terms of the direct effect of banking system competition, we find that less competitive banking systems have higher growth since the coefficients for the competitiveness measure is statistically significant negative (column 3). The competitiveness interacted with financial dependence is also negative statistically significant, again suggesting that access is improved when the banking system is less competitive. This effect disappears, however, when the interaction between private credit and financial dependence is also included (column 4) or when more country control variables are included (column 5). These results support the view that market power can be good in general, as the competitiveness measure remains statistically significant negative, but not necessarily through the financing needs channel.

As we found, the growth effect of competition may vary by the development of the financial sector. Therefore, we look at the interaction between the competitiveness measure and the banking system development, without considering financial dependence. We find that the interaction between the competitiveness measure and the size of the banking system is also statistically significant positive (column 6). Thus, having a more competitive banking system may be more important when the system is deeper. The positive coefficient of 0.511 for the

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interaction and the negative 0.303 coefficient for the competitiveness measure alone imply that for the average level of credit, 0.379, less competition is still better. Only for a level of private credit to GDP more than 60 percent is more competition better for sectoral growth.

Column 7 expands on these results by also including the triple interaction between the competitiveness measure, the size of the private credit in the country and the sectoral financial dependence. This triple interaction variable has a coefficient of 0.594, similar to that of column 8 in Table 4, while the competitiveness measures interacted with financial dependence now has a statistically significant coefficient of 0.251, also similar to that of column 8 in Table 4. The coefficients imply that the ratio of private credit to GDP for which the effect of competition through the provision of external financing becomes positive is 0.42, close to the average credit to GDP ratio of 38 percent. As before, this implies that for countries with more than average developed financial systems, the effects of more competition are positive for financially dependent firms, while for less developed financial systems, less competition is better for external financially dependent firms. These results remain similar even when including other country control variables (column 8) as the coefficients remain very similar (0.564 and –0.237, respectively).

The effect of competition through the external financing channel need not be the only channel. The regression results of columns 7 and 8 also show negative coefficients for the simple, non-interacted competitiveness measure (-0.242 and –0.280), suggesting that less competition is better. Yet, there is again the effect of the level of financial sector development to consider which, in this case, is picked up by the interaction between the competitiveness measure

and the private credit to GDP ratio, for which the coefficients are positive (0.333 and 0.409).
The combination of the two coefficients suggests that for levels of private credit to GDP ratio
greater than about 70%, more competition is associated with higher growth, while for lower
credit ratios the opposite is the case.[5]

We investigate the robustness of our results using instrumental variables techniques,
where as instrument we use the country's legal origin. Since we have only one instrumental
variable, we are able to run only a few instrumental variables regressions. The first basically
confirms the original RZ-effects that financially dependent firms grow faster in more developed
financial systems, conforming that the effect is not due to an omitted variable (column 1). We
also find that more financially dependent firms grow faster in less competitive financial systems
(column 2). We cannot investigate the combined effects of the financial development and
competitiveness credit for financially dependent industries since we do not have enough
instrumental variables.

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[5] Interestingly, the interaction variable of financial dependence with private credit (the original RZ-variable)
becomes statistically significant negative in regression 7, although it loses significance in regression 8. However,
these coefficients should be interpreted together with the positive coefficient on the triple interaction term that also
includes the interaction of financial dependence with private credit. The combined effect of the financial dependence
and private credit interaction variable on growth is always non-negative, even at low levels of competition,
consistent with the RZ result.

4. CONCLUSIONS

Using a large cross-section of countries, we relate a structural measure of banking system competitiveness to industrial growth. We find that external financial dependent sectors grow faster in less competitive banking systems. We also find that greater competition reduces industrial growth in general. These effects depend, however, upon the state of development of a country's financial system and are reversed when the financial system is larger: in well-developed financial systems more competition helps industrial growth. The view that market power in banking systems is associated with lower competitiveness is good for access to financing thus finds support for less developed financial systems. In more developed systems, competitive pressure may be the best for financial sector functioning. We do not find evidence that market structure, that is, concentration, helps predict industrial sector growth. While it may be, as others have found, that more concentrated banking systems better provide financing to external financially dependent firms, this does not seem to reflect the consequences of market power, or less competitive systems, but might capture other aspects. We find that these results remain using some robustness tests.

These interpretations are tentative, however, since we did not investigate in detail the channels through which increased competition may affect financial sector functioning. 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 our measure of competition 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. Importantly, while we found that the effects of competition depend on the level of financial sector development, we did not explore other measures of countries' characteristics, including institutional aspects that may explain this effect. It is possible, for example, that the degree of informational opaqueness can both explain a low level of financial sector development and why limited competition is useful for access to financing—through the importance of relationships lending. While this type of omitted variable problem is reduced given our specification, we can not eliminate the possibility that omitted variables drive the results.

Nevertheless, our results confirm some of the theoretical literature that competition can affect access to external financing. They also suggest that the effects of competition—important for industry functioning, in terms of breadth of services, and costs and quality of products—may vary by the level of financial sector development. The fact that market power matters in providing external finance supports some theory, or even in opposite ways to other findings, might still surprise. At the minimum, it suggests that competition in the financial sector is complicated, while balancing the view that more competition is uniformly good for financial services. While competition may be good in terms of lowering costs and improving the quality financial services, it need not lead to greater access.

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Table 1. Definition and Source of the Variables

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.

Variable	Description
Growth	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: 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) and the International Financial Statistics of the International Monetary Fund.
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 H-statistic for the period 1994-2001. Source: Claessens and Laeven (2003).
Market cap	Stock market capitalization divided by GDP in 1980. Source: Rajan and Zingales (1998).
Human capital	Human capital is the average for 1980 of the years of schooling attained by the population over 25 years of age. Source: Barro and Lee (1993).
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. (1999).

Table 2. Summary Statistics

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

Variable	Mean	Standard deviation	Minimum	Maximum	Number of observations
Growth	0.0305	0.0809	-0.4474	1.0000	1279
Share in value added	0.0157	0.0206	0.0000	0.2244	1263
Financial dependence	0.3135	0.3970	-0.4512	1.4915	1376
Private credit	0.3792	0.1998	0.0686	0.8564	1415
Concentration	0.5476	0.1802	0.2100	0.8700	1415
Competition	0.6586	0.1120	0.4600	0.8600	1043
Private credit * Financial dependence	0.1189	0.1823	-0.3864	1.2773	1376
Concentration * Financial dependence	0.1722	0.2370	-0.3925	1.2976	1376
Competition * Financial dependence	0.2060	0.2685	-0.3880	1.2827	1013
Competition * Private credit	0.2425	0.1281	0.0473	0.5191	1043
Competition * Private credit * Financial dependence	0.0757	0.1162	-0.2342	0.7742	1013

Table 3. Correlation Matrix

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

	Growth	Share in value added	Financial dependence	Private credit	Concentration	Competition
Growth	1					
Share in value added	-0.134	1				
	0.000					
Financial dependence	0.098	-0.076	1			
	0.001	0.008				
Private credit	0.057	0.015	-0.001	1		
	0.040	0.595	0.984			
Concentration	-0.155	0.061	0.006	-0.218	1	
	0.000	0.030	0.813	0		
Competition	-0.211	0.083	-0.006	-0.220	0.333	1
	0.000	0.010	0.848	0	0	

Table 4. Industry and Country-Effects

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%.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Share in value added	-0.805***	-0.747***	-0.878***	-0.836**	-0.821**	-0.871**	-0.871**	-0.868**
	(0.256)	(0.257)	(0.339)	(0.339)	(0.340)	(0.342)	(0.342)	(0.339)
Private credit * Financial dependence	0.099***		0.080**			0.075*	0.075*	-0.250
	(0.036)		(0.039)			(0.039)	(0.038)	(0.155)
Concentration * Financial dependence		-0.003		-0.054			0.002	
		(0.036)		(0.038)			(0.031)	
Competition * Financial dependence					-0.080*	-0.034	-0.035	-0.220*
					(0.046)	(0.045)	(0.048)	(0.115)
Competition * Private credit * Financial dependence								0.548*
								(0.302)
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1190	1190	901	901	901	901	901	901
Number of countries	40	40	29	29	29	29	29	29
R-squared	0.31	0.30	0.28	0.27	0.27	0.28	0.28	0.28

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Table 5. Country-Control Variables

Dependent variable is real growth in sectoral value added over the period 1980-1997, when available. Regressions are estimated using OLS and include industry 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%.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Share in value added	-0.790***	-0.829***	-0.694**	-0.728**	-0.708**	-0.839***	-0.827***	-0.820***
	(0.218)	(0.279)	(0.296)	(0.300)	(0.315)	(0.278)	(0.275)	(0.286)
Private credit	-0.007	-0.008		-0.025	0.015	-0.331***	-0.225***	-0.230**
	(0.017)	(0.019)		(0.019)	(0.018)	(0.065)	(0.081)	(0.092)
Competition			-0.113***	-0.127***	-0.134***	-0.303***	-0.242***	-0.280***
			(0.026)	(0.027)	(0.034)	(0.050)	(0.061)	(0.075)
Private credit * Financial dependence	0.099***	0.083**		0.073*	0.070*	0.079**	-0.273*	-0.258
	(0.037)	(0.039)		(0.039)	(0.039)	(0.038)	(0.165)	(0.161)
Competition * Financial dependence			-0.098**	-0.054	-0.052	-0.049	-0.251**	-0.237**
			(0.049)	(0.051)	(0.050)	(0.049)	(0.118)	(0.119)
Competition * Private credit						0.511***	0.333**	0.409***
						(0.115)	(0.149)	(0.152)
Competition * Private credit * Financial dependence							0.594*	0.564*
							(0.311)	(0.306)
Market cap					0.060***			0.067***
					(0.010)			(0.010)
Human capital					-0.003			-0.002
					(0.002)			(0.002)
Per capita GDP					-0.008			-0.010
					(0.007)			(0.006)
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country dummies	No	No	No	No	No	No	No	No
Observations	1190	901	901	901	901	901	901	901
Number of countries	40	29	29	29	29	29	29	29
R-squared	0.11	0.10	0.13	0.14	0.19	0.19	0.19	0.19

Table 6. Instrumental Variables

Dependent variable is real growth in sectoral value added over the period 1980-1997, when available. Regressions are estimated using instrumental variables and include industry and country dummies (not reported). As instrument for private credit 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%.

	(1)	(2)	(3)
Share in value added	-0.788***	-0.859**	-0.800**
	(0.256)	(0.340)	(0.341)
Private credit * Financial dependence	0.070**	0.049*	
	(0.032)	(0.029)	
Competition * Financial dependence			-0.288***
			(0.096)
Observations	1190	901	901
Number of countries	40	29	29
R-squared	0.30	0.28	0.26

Annex. Country-averages of the main regression variables

Growth is real growth in sectoral value added for the period 1980-97. Financial dependence is the external financial dependence measure. Private credit is private credit to GDP in 1980. Market cap is stock market capitalization to GDP in 1980. Concentration is the 3-bank concentration ratio for the period 1989-96. Competition is the average H-statistic for the period 1994-2001. Definitions and data sources of the variables are in Table 1.

Country	Growth	Financial dependence	Private Credit	Market cap	Concentration	Competition
Australia	0.0103	0.3187	0.2764	0.3842	0.60	0.80
Austria	0.0286	0.2988	0.7658	0.0285	0.42	0.66
Bangladesh	0.0492	0.3187	0.0686	0.0018	0.62	0.69
Belgium	0.0002	0.2705	0.2901	0.0904	0.49	0.73
Brazil	0.0373	0.2803	0.2331	0.0452	0.40	0.83
Canada	0.0229	0.3187	0.4453	0.4603	0.57	0.67
Chile	0.0656	0.3187	0.3566	0.3447	0.45	0.66
Colombia	0.0362	0.3187	0.1445	0.0520	0.35	0.66
Denmark	0.0205	0.3187	0.4195	0.0865	0.74	0.50
Egypt	0.0628	0.3187	0.2093	0.0104	0.58	
Finland	0.0214	0.3187	0.4824	0.0595	0.85	
France	0.0236	0.2922	0.5444	0.0991	0.28	0.69
Germany	0.0379	0.3250	0.7788	0.0946	0.27	0.58
Greece	0.0165	0.3187	0.4402	0.0760	0.79	0.76
India	0.0709	0.3187	0.2441	0.0486	0.40	0.53
Israel	0.0219	0.3339	0.6694	0.3489	0.79	
Italy	0.0178	0.2861	0.4160	0.0716	0.24	0.60
Japan	0.0464	0.3187	0.8564	0.3017	0.21	0.47
Jordan	0.0562	0.3187	0.5425	0.4959	0.87	
Kenya	-0.0170	0.3347	0.2044	0.0000	0.59	0.58
Korea	0.1182	0.3187	0.4971	0.0783	0.28	
Malaysia	0.1106	0.3187	0.4837	0.6549	0.44	0.68
Mexico	-0.0112	0.3187	0.1648	0.0676	0.53	0.78
Morocco	0.0714	0.2825	0.1570	0.0242	0.57	
Netherlands	-0.0032	0.3022	0.6036	0.1934	0.77	0.86
New Zealand	0.0239	0.3187	0.1865	0.3321	0.75	
Norway	0.0106	0.3187	0.3429	0.0583	0.60	0.57
Pakistan	0.0738	0.2975	0.2517	0.0285	0.71	0.48
Peru	-0.0341	0.3187	0.1063	0.0595	0.64	0.72
Philippines	0.0401	0.3187	0.2811	0.0969	0.40	0.66
Portugal	0.0176	0.3187	0.5184	0.0075	0.46	0.67
Singapore	0.0742	0.2814	0.5663	1.6240	0.61	
South Africa	0.0219	0.3256	0.2598	1.2031	0.69	0.85
Spain	0.0243	0.3187	0.7552	0.0927	0.34	0.53
Sri Lanka	-0.0222	0.3187	0.2102	0.0616	0.75	
Sweden	-0.0017	0.3187	0.4187	0.1074	0.71	
Turkey	0.0990	0.3187	0.1407	0.0092	0.41	0.46
UK	-0.0059	0.3187	0.2498	0.3799	0.50	0.74
Venezuela	-0.0228	0.3187	0.3024	0.0488	0.47	0.74
Zimbabwe	-0.0230	0.3087	0.2991	0.4499	0.78	
Total	0.0305	0.3135	0.3792	0.2086	0.55	0.66