

Finance, Firm Size, and Growth

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This draft: June 23, 2005

Abstract: This paper provides empirical evidence on whether financial development boosts the growth of small firms more than large firms and hence provides information on (1) conflicting theoretical predictions about the distributional effects of financial development and (2) the mechanisms through which financial development fosters aggregate economic growth. Using cross-industry, cross-country data, the results are consistent with the view that financial development exerts a disproportionately positive effect on small firms.

Keywords: Firm Size; Financial Development; Economic Growth

JEL Classification: G2, L11, L25, O1

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I. Introduction

Theory provides conflicting predictions about the distributional effects of financial development and the mechanisms through which financial development affects aggregate economic growth.¹ Some theories imply that financial development boosts economic growth by disproportionately fostering small firm growth. If smaller firms face tighter credit constraints than large firms face due to greater informational barriers or high fixed costs associated with accessing financial services, then financial development that ameliorates market frictions will exert an especially positive impact on smaller firms (Banerjee and Newman, 1993; Galor and Zeira, 1993; Aghion and Bolton, 1997).² In contrast, other research suggests that many small firms cannot afford financial services (especially in poor countries), so that financial development spurs aggregate growth by disproportionately helping large firms (Greenwood and Jovanovic, 1990).³ Alternatively, financial development may have a balanced impact on firms of different sizes and therefore have no distributional effects.

This paper provides empirical evidence on whether financial development boosts the growth of small firms more than large firms and hence sheds empirical light on (1) debates concerning the cross-firm distributional implications of financial development and (2) one possible mechanism through which financial development may affect aggregate economic growth. While considerable research suggests that finance is closely associated with aggregate economic growth, we test the

¹ See Levine (2005) for a review of the literature on finance and growth. Specifically, cross-country studies (King and Levine, 1993; Beck, Levine, and Loayza, 2000; Levine, Loayza, and Beck, 2000), firm-level studies (Demirguc-Kunt and Maksimovic, 1998), and industry-level studies (Rajan and Zingales, 1998; Wurgler, 2000) find that financial development boosts growth and this relationship is not due only to reverse causality. Aghion, Howitt, and Mayer-Foulkes (2005) find that financial development accelerates the speed of convergence toward a steady state, but does not influence steady-state growth.

² In these models, financial development that lowers information or transaction costs disproportionately benefits less wealthy entrepreneurs. In terms of U.S. banks, Jayaratne and Strahan (1998) find that efficiency improvements reduced the fixed costs included in loan prices, helping small firms.

³ Levine and Schmukler (2003, 2005) provide evidence that international financial liberalization has primarily benefited large firms. Also, local banking monopolies may foster close relationships between banks and small firms and thereby

empirical validity of a specific theoretical mechanism connecting financial development, to firm-specific traits, to aggregate growth. The results, therefore, provide information on whether financial development is simply a characteristic of fast growing economies, or whether finance affects growth through a particular channel.

We examine whether industries that have a larger composition of small firms for technological reasons grow faster in economies with well-developed financial systems. As formulated by Coase (1937), firms should internalize some activities, but size enhances complexity and coordination costs. Thus, an industry's "technological" firm size depends on that industry's particular production processes, including capital intensities and scale economies (Kumar, Rajan, and Zingales, 2001). Given empirical estimates of each industry's technological share of small firms, we use a sample of 44 countries and 36 industries in the manufacturing sector to examine the growth rates of different industries across countries with different levels of financial development. If "small-firm industries" – industries naturally composed of small firms for production technology reasons – grow faster than "large-firm industries" in economies with more developed financial systems, then this suggests that (i) financial development boosts the growth of small-firm industries more than large-firm industries and (ii) one mechanism through which financial development accelerates growth is by fostering the growth of small firms. Instead, if financial development disproportionately boosts the growth of large-firm industries, then this implies quite different distributional effects. Finally, financial development may foster balanced growth, and therefore we would not find cross-industry distributional effects.

More specifically, we extend the Rajan and Zingales (1998, henceforth RZ) methodology to examine whether financial development enhances economic growth by easing constraints on

increase credit availability to small firms (Petersen and Rajan, 1994, 1995). If financial development intensifies competition and breaks these monopolies, it may also hurt small firms.

industries that are technologically more dependent on small firms. RZ find that industries that are technologically more dependent on external finance grow disproportionately faster in countries with developed financial systems. They measure an industry's need for external finance (the difference between investment and cash from operations) using data on large, public corporations in the United States. Assuming that financial markets are relatively frictionless for large listed companies in the United States, RZ identify each industry's "technological" demand for external finance, i.e., the demand for external finance in a frictionless financial system. They further assume that this technological demand for external finance is the same across countries. Instead of only considering each industry's technological dependence on external finance, we also examine each industry's technological share of small firms. We measure an industry's "technological" composition of small firms relative to large firms as the share of employment in firms with less than 20 employees in the United States. Assuming that financial markets are relatively frictionless in the United States, we therefore identify each industry's "technological" share of small firms in a relatively frictionless financial system. While conducting a large number of sensitivity checks regarding the validity of this benchmark measure, we test whether industries that are technologically more dependent on small firms grow faster in countries with more developed financial systems.

The results indicate that small-firm industries grow disproportionately faster in economies with well-developed financial systems, which has two key implications. First, the findings indicate that financial development has cross-industry distributional ramifications: Financial development exerts a particularly positive growth effect on industries that are technologically more dependent on small firms. Second, the analyses advertise one mechanism through which finance influences aggregate economic growth: Financial development removes growth constraints on small-firm industries. Our analyses suggest that large-firm industries are not the same as industries that rely

heavily on external finance. We control for cross-industry differences in external dependence, and confirm the RZ finding that financial development disproportionately boosts the growth rate of industries that are more dependent on external finance. Even when controlling for cross-industry differences in external dependence, however, we find that financial development disproportionately accelerates the growth of industries that are composed of small firms for technological reasons.

These results are robust to an array of sensitivity checks. Besides confirming the findings over different estimation periods, the results hold when using (i) alternative indicators of financial intermediary development, (ii) indicators of legal system efficiency to proxy for the financial contracting environment, or (iii) firm-level measures of corporate financing constraints to gauge financial development. However, we do not find a significant interaction between the small firm share and indicators of stock market development and accounting standards. This suggests that small-firm industries depend on financial intermediaries and efficient property rights enforcement to access external finance, rather than on equity markets and formal accounting systems.

Furthermore, we were concerned that the small-firm share might proxy for other industry characteristics that interact with country-level traits to explain industry growth. For instance, Claessens and Laeven (2003) find that industries characterized by high levels of intangible assets grow faster in countries with strong private property rights protection. If small firms have higher levels of intangible assets and strong property rights underlie financial development (Levine, 1999), then our results may be spurious. We confirm our results, however, when controlling for the interaction of industrial reliance on intangible assets and national property rights protection. Similarly, Fisman and Love (2003) argue that financial development is particularly important for industries with substantial growth opportunities. If in our sample, small-firm industries are also those industries with above average growth opportunities, we may be capturing cross-industry

differences in growth opportunities, not cross-industry differences in the role of small firms. Again, however, when controlling for the interaction of financial development and each industry's growth rate in the United States, we continue to find that financial development exerts a particularly large impact on the growth of industries that are naturally composed of small firms.

We also tested whether other country-specific traits – such as labor market frictions, barriers to new firm formation, human capital, market size, and the level of economic development -- (i) invalidate the use of the United States as the benchmark country for determining each industry's technological composition of small firms or (ii) lead to spurious conclusions about the importance of financial development for the growth of small firms. Nevertheless, even when controlling for these country-specific traits, we continue to find that financial development exerts a particularly pronounced growth-effect on small-firm industries. Thus, although regulatory impediments to labor mobility and the entry of new firms exert an especially damaging effect on small firm growth, we still find that financial development enters significantly when controlling for these other country traits.

Critically, we also assess the validity of our measures of the technological importance of small firms in each industry. We use different definitions of a small firm (including 5, 10, 20, 100, and 500 employees) and show that the results hold when defining a small firm as having less than 100 employees. Moreover, we confirm this paper's findings using the United Kingdom, Germany, and France as the benchmark country for computing the share of small firms in each industry. The results are also robust to controlling for the median firm size of each industry within the benchmark country. This is crucial. Our goal is to measure the technological importance of small firms in an industry, not median (or average) firm size. We do not want to measure median (or average) firm size since two industries could have the same median (or average) firm size but the composition of

small firms could differ markedly. For instance, two industries may have median firm size of 500, but one of those industries may have no firms with fewer than 100 employees, while the second may have half of the firms with fewer than 100 employees. Thus, for conceptual reasons, we want to measure the share of small firms in each industry in the benchmark country. We find that the interaction between median firm size and financial development is unrelated to industry growth, but our results with small firm share are robust to controlling for this interaction term. This provides confirmatory support for our measure of the technological importance of small firms in each industry.

There are limitations to our analyses. Some theories predict that financial development lowers information and transaction costs in ways that are particularly beneficial to small firms. We find evidence consistent with these theories. We do not, however, examine the links in the chain from financial development, to particular information and transaction costs, and on to small firm growth.⁴ Thus, although this paper's findings indicate that financial development boosts economic growth by fostering the growth of industries that are naturally composed of small firms, further research needs to link these findings to specific information and transactions costs. Along similar lines, financial market imperfections could impede the growth of small-firm industries by causing firm size to deviate from its optimum or by hindering the flow of capital and other financial services to small firms. We do not explicitly distinguish among these possibilities. Furthermore, we do not directly examine individual firms because of the lack of comparable, detailed data on small firms across the different regions of the world. Thus, to evaluate theoretical disputes about the distributional effects of financial development and shed empirical light on the channels linking financial development with economic growth, we compute estimates of each industry's

⁴ This is similar to RZ. They find evidence consistent with theories stressing that financial development reduces the cost of external finance. They do not, however, measure the cost of external finance directly.

technological composition of small firms and test whether financial development influences small firm industries differently from large firm industries.

Our paper complements two recent empirical papers that examine the importance of financial development for small firms. Using evidence across different regions in Italy, Guiso, Sapienza, and Zingales (2004) find that small firms enjoy more growth benefits than large firms from regional financial development.⁵ Rather than focusing on inter-regional differences in Italy, we undertake a cross-country, cross-industry investigation. Beck, Demirguc-Kunt, and Maksimovic (2005) use survey data to assess the relationship between the financing obstacles that firms report they face and firm growth. They find that the negative impact of reported obstacles on firm growth is stronger for small firms than large firms and stronger in countries with under-developed financial systems. Their study has the advantage of using cross-country, firm-level data, but it has the disadvantage of relying on survey responses regarding the obstacles that firms encounter. In contrast, we use a different methodology that assesses whether industries that are naturally composed of small firms grow faster in countries with better-developed financial systems. Our research provides complimentary information on whether financial development fosters aggregate growth by disproportionately facilitating the growth of small firm industries.

Finally, our research relates to public policy considerations and a large body of research on the political economy of financial reform.⁶ Specifically, the World Bank (1994, 2002, 2004) argues that small firms foster competition, innovation, and employment to a greater degree than large firms and has consequently devoted more than \$10 billion in the last five years toward promoting small enterprises. Our research suggests that policies that thwart financial development exert a

⁵ In terms of new firm formation, Guiso, Sapienza, and Zingales (2004) also find that new firm creation is higher in Italian regions that are more financially developed. Similarly, Black and Strahan (2002) show that more competitive banking markets are associated with higher levels of new incorporations in the United States.

⁶ See Haber, Razo, and Maurer (2003) and Barth, Caprio, and Levine (2005) for discussions and citations.

particularly onerous impact on small firms and through this mechanism on economic growth.

Furthermore, although we do not examine political economy forces directly, our work shows that financial development has distributional implications, with small firm industries gaining more than large firm industries. This is consistent with arguments from the political economy literature that specific segments of society may oppose financial development even if it boosts aggregate output because financial development diminishes the comparative economic power of those segments.

The remainder of the paper is organized as follows. Section II explains the data, while Section III describes the methodology. Section IV presents the main results and sensitivity tests. Section V concludes.

II. Data

To assess whether financial development boosts the growth of industries that for technological reasons are naturally composed of small firms more than the growth rate of large-firm industries, we need (i) measures of industry growth, (ii) measures of each industry's technological firm size, and (iii) country-level indicators of financial development. This section describes these key variables. The data cover 44 countries and 36 industries in the manufacturing sector. Table 2 presents descriptive statistics.

II.1. Industry growth rates

$\mathbf{Growth}_{i,k}$ equals the average annual growth rate of real value added of industry k in country i over the period 1980 to 1990. Thus, we have cross-country, cross-industry data on industrial growth rates. We use the data obtained by RZ from the *Industrial Statistics Yearbook* database,

which is assembled by the United Nations Statistical Division (1993). In robustness tests below, we show that the results hold over different estimation periods.

II.2. Measure of Small Firm Share

Since our goal is to assess whether industries that are naturally composed of small firms grow faster, or slower, than large-firm industries in countries with greater financial development, we need to measure each industry's "natural" or technological share of small firms. Differences in productive technologies influence an industry's technological firm size (Coase, 1937, and Kumar, Rajan, and Zingales, 2001).⁷ Therefore, to get a proxy measure of each industry's share of small firms, we need a benchmark economy with relatively few market imperfections and policy distortions, so that we capture, as closely as possible, only the impact of cross-industry differences in production processes, capital intensities, and scale economies on cross-industry firm size.

Small Firm Share_k equals industry k 's share of employment in firms with less than 20 employees in the United States, and is obtained from the 1992 Census.⁸ In our baseline regressions, we use Small Firm Share as the measure of each industry's "natural" or "technological" share of small firms. Table 1 lists the Small Firm Share for each industry in the sample. The Small Firm Share has a mean of 6 %, but varies widely from 0.1 % in manufacturing of pulp, paper and paperboard to 21% in wood manufacturing. In sensitivity checks emphasized below, we consider many alternative measures of each industry's natural share of small firms and we test for the importance of several potential problems associated with using the United States as the benchmark country for measuring technological firm size.

⁷ See You (1995) for an overview.

⁸ We do not use measures of Small Firm Share prior to 1992 because the U.S. Census did not start collecting firm size data at the firm level until 1992. Before 1992, the data were collected at the plant level. From a theoretical perspective, we need data at the firm level, not the plant level, and we therefore do not resort to Census data prior to 1992.

Given our focus on the relationship between financial development, firm size, and growth, we start by using the United States to form the benchmark measure of an industry's technological share of small firms. As in RZ, this relies on the assumption that U.S. financial markets are relatively frictionless. Based on this assumption, Small Firm Share measures the share of small firms for each industry in a relatively frictionless financial system. U.S. markets, of course, are not perfect. Indeed, Evans and Jovanovic (1989) argue that small firms in the United States are also more liquidity constrained than large firms as in other countries.

Our empirical methods, however, do not require that the U.S. financial system is perfect. Rather, we require that financial market imperfections in the United States do not distort the ranking of industries in terms of the technological share of small firms within each industry. Since the United States has one of the most developed financial systems in the world by many measures (Demirguc-Kunt and Levine, 2001), it represents a natural benchmark for providing a ranking of each industry's technological share of small firms.

As noted, the perfect benchmark country has relatively frictionless markets and few policies distorting firm size beyond the financial sector. For instance, differences in human capital, market size, contract enforcement, and overall institutional development may influence industrial firm size beyond technological factors, such as scale economies, capital intensities, and industry-specific production processes shaping long-run average cost curves (You, 1995, and Kumar, Rajan, and Zingales, 2001). Thus, the ideal benchmark economy not only has relatively frictionless financial markets; it has relatively frictionless markets in general.

Again, the United States is a reasonable benchmark to derive each industry's technological Small Firm Share. The United States has the full spectrum of human capital skills and indeed attracts both high and low human capital workers from the rest of the world (Easterly and Levine,

2001). Furthermore, comparative studies of U.S. and European labor markets suggest that the United States has many fewer policy distortions. Moreover, the U.S. internal market is huge and – given its size – it is comparatively open to international trade. Furthermore, many studies point to the United States as having a superior contracting environment and well-developed institutions (La Porta et al, 1999). Moreover, the United States does not need to have perfect labor markets, contracting systems, or institutions to act as a reasonable benchmark. To represent a good benchmark for Small Firm Share, we simply require that policy distortions and market imperfections in the United States do not distort the ranking of industries in terms of the technological share of small firms within each industry.

Furthermore, we present a battery of sensitivity analyses that assess the validity of using the United States as the benchmark country by (1) using different measures of Small Firm Share and (2) using different benchmark countries. Furthermore, since omitting country-specific factors that interact with industry characteristics and explain industry growth could bias the results, we control for an array of country traits. As we describe below, however, the results are robust to a variety of sensitivity checks.

We focus on the share of small firms (in terms of employment) in each industry rather than the median (or average) size of firms in an industry for conceptual reasons. The goal is to test whether small firms face greater barriers to accessing financial services than large firms, so we want to measure the share of small firms in an industry, not the average firm size, which may reflect the influences of a few firms, nor the median size, which is silent about whether small firms (by any definition of employment) are an important component of the industry. While the median firm size is negatively and significantly correlated with Small Firm Share (-0.41), this correlation is far from perfect. For example, the beverages industry and the manufacturing of motor vehicles industry

have similar median firm sizes, but the number of employees in small firms is almost twice as high in the beverage industry as it is in the motor vehicles industry (see Table 1). For production technology reasons, there is much less variation in the size of car manufacturers: It is difficult to have 10-20 workers run an automobile manufacturing firm. In contrast, although there are massive beverage manufacturers (Budweiser), there are microbreweries and small wineries so that the beverage industry has a smaller technological firm size due its particular production processes than the car manufacturing industry. Conceptually, this is what we are trying to capture, so we focus on Small Firm Share.

II.3. Indicator of financial development

Ideally, one would like indicators of the degree to which the financial system ameliorates information and transactions frictions and facilitates the mobilization and efficient allocation of capital. Specifically, we would like indicators that capture the effectiveness with which financial systems research firms and identify profitable projects, exert corporate control, facilitate risk management, mobilize savings, and ease transactions. Unfortunately, no such measures are available across countries. Consequently, we rely on an assortment of traditional measures of financial development that existing work shows are robustly related to economic growth.

Private Credit_{*i*} equals the value of credits by financial intermediaries to the private sector divided by GDP for country *i*. It captures the amount of credit channeled through financial intermediaries to the private sector. Levine, Loayza, and Beck (2000) show that Private Credit is a good predictor of economic growth and also use instrumental variables in stressing that the strong, positive association between Private Credit and economic growth is not due to reverse causality. In our baseline regression, we measure Private Credit in the initial year of our estimation period, 1980

(or the first year in which data are available). We use the initial year to control for reverse causation. Since using initial values instead of average values implies an informational loss, we also use Private Credit, averaged over the period 1980-89 in our sensitivity analysis. Furthermore, we use instrumental variables to extract the exogenous component of Private Credit. Data for Private Credit are from Beck, Demirguc-Kunt and Levine (2000). There is a wide variation in Private Credit in our sample, ranging from 7% in Bangladesh to 117% in Japan.⁹

In sensitivity tests, we use several alternative indicators of financial development. To save space, we do not define the different financial development measures here. Rather, we jointly define these variables and present the sensitivity analyses below.

III. Methodology

To examine whether industries that are naturally composed of small firms grow faster than large-firm industries in countries with higher levels of financial development, this paper extends the methodology developed by RZ. In particular, we interact an industry characteristic – each industry’s technological small firm share – with a country-characteristic – the level of financial development. In describing the econometrics more rigorously, we only discuss the interaction between financial development and Small Firm Share. In the actual implementation, we control for the interaction of financial development with the external financial dependence of each industry as stressed by RZ.

Econometrically, we use the following regression:

$$Growth_{i,k} = \sum_i \alpha_i Country_i + \sum_k \beta_k Industry_k + \gamma Share_{i,k} + \delta (Small Firm Share_k * FD_i) + \varepsilon_{i,k},$$

where $Growth_{i,k}$ is the average annual growth rate of value added, in industry k and country i , over the period 1980 to 1990. $Country_i$ and $Industry_k$ are country and industry dummies, respectively,

⁹ Annex Table 1 lists Private Credit for all countries in the sample.

and $Share_{i,k}$ is the share of industry k in manufacturing in country i in 1980. $Small Firm Share_k$ is the benchmark share of small firms in industry k , which in our baseline specification equals the share of employment in firms with less than 20 employees in the United States in 1992. FD_i is an indicator of financial development for country i , which equals Private Credit in our baseline regression. We include the interaction between the share of small firms in an industry with financial development. We do not include financial development on its own, since we focus on within-country, within-industry growth rates. The dummy variables for industries and countries correct for country and industry specific characteristics that might determine industry growth patterns. We thus isolate the effect that the interaction of Small Firm Share and Private Credit has on industry growth relative to country and industry means. By including the initial share of an industry we control for a convergence effect: industries with a large share might grow more slowly, suggesting a negative sign on γ . We include the share in manufacturing rather than the level, since we focus on within-country, within-industry growth rates.¹⁰ We exclude the United States (the benchmark country) from the regressions.

In interpreting the results, we focus on the interaction of financial development and small firm share, i.e., we focus on the sign and significance of δ . If δ is positive and significant, this suggests financial development exerts a disproportionately positive effect on small-firm industries relative to large-firm industries. This would suggest that financial development tends to ease growth constraints on small firms more than on large firms. A negative and significant sign would suggest that it is mostly large firms that benefit from the development of financial markets. An insignificant coefficient would suggest that financial development influences industries that are naturally composed of small firms the same as industries naturally composed of large firms. Thus, if δ enters

¹⁰ While this effect is similar, it does not correspond exactly to the convergence concept known from cross-country

insignificantly, this would not support the view that financial development has cross-industry distributional consequences and would not support the view that one channel through which financial development boosts aggregate economic growth is by disproportionately easing constraints on small firm growth.

Apart from using Ordinary Least Squares (OLS) regressions, we also run Instrumental Variables (IV) regressions to address the issue of endogeneity of financial development. Based on research by La Porta et al. (1998), Levine (1999), Levine, Loayza, and Beck (2000), and Beck, Demirguc-Kunt, and Levine (2003), we use the legal origin of countries as instrumental variables for financial development. Legal systems are typically classified into four major legal families: the English common law and the French, German, and Scandinavian civil law countries, and we use dummy variables for these categories of legal origin as instruments (excluding one category, Scandinavian civil law countries, which is included in the constant term).

IV. Results and Sensitivity Tests

IV.1. Main Results

Table 3 results suggest that small-firm industries (industries with technologically larger shares of small firms) grow faster in economies with better-developed financial intermediaries. The interaction of Private Credit with Small Firm Share enters positively and significantly at the 5% level in column (1). We also find that the coefficient on Industry Share enters negatively and significantly. This is consistent with the convergence effect identified by RZ. Overall, these results indicate that industries whose organization is based more on small firms than on large firms grow faster in countries with better-developed financial intermediaries.

growth regressions.

The relationship between financial development, an industry's small firm share, and industry growth is not only statistically, but also economically large. To illustrate the effect, we compare the growth of an industry with a relatively large share of small firms and an industry with a relative low share of small firms across two countries with different levels of financial development.

Specifically, the results in column (1) suggest that the furniture industry (75th percentile of Small Firm Share) should grow 1.4% per annum faster than the spinning industry (25th percentile of Small Firm Share) in Canada (75th percentile of Private Credit) than in India (25th percentile of Private Credit).¹¹ Since the average growth rate in our sample is 3.4%, this is a relatively large effect.

Given the influential findings of RZ, we were concerned that there might be a large, negative correlation between industries that are naturally heavy users of external finance and industries that are naturally composed of small firms. If this were the case, then it would be difficult to distinguish between the RZ finding that externally dependent industries grow faster in economies with well-developed financial systems and our result that small-firm industries grow faster in economies with well-developed financial systems. While there is a negative correlation between Small Firm Share and External Dependence, it is very small (-0.04) and insignificant. This suggests that the industry characteristics explaining firm size distribution are not the same as the characteristics explaining technological dependence on external finance.

Moreover, Table 3 (i) advertises the robustness of the original RZ result on external dependence and (ii) illustrates the robustness of the result on industry small firm share when controlling for external dependence. As shown in column (2), the interaction between each industry's level of external dependence and financial development (Private Credit * External Dependence) enters positively and significantly. This indicates that industries that are naturally heavy users of external finance grow faster in economies with higher levels of financial

¹¹ We use the results of column 2 in Table 3 for this experiment.

development. Since we also control for cross-industry differences in the technological level of small firm share, this represents an additional robustness test on the RZ finding. Moreover, column (2) shows that the interaction between each industry's technological Small Firm Share and financial development (Private Credit*Small Firm Share) enters positively and significantly when controlling for external dependence. Thus, we find that industries with technologically larger shares of small firms grow more quickly in countries with higher levels of financial development even when controlling for cross-industry differences in external dependence.¹²

Table 3 also provides four robustness tests. First, we were concerned that there may be industry-specific shocks within industries across all countries. If this is the case, then it is inappropriate to treat the errors as independent. Thus, in column (3), we present regression where we cluster at the industry level, i.e. we allow error terms to be correlated within industries but not across industries. As shown, this does not change the results.

Second, we were concerned about possible simultaneity bias. In column (4), we present results using instrumental variables, which indicate that the relationship between Small Firm Share, financial development, and industry growth is not due to reverse causation or simultaneity bias. Here we extract the exogenous component of Private Credit using the legal origin of countries. We instrument both the interaction of Private Credit with Small Firm Share and the interaction of Private Credit with External Financial Dependence. The first-stage regression results support the use of legal origin as an instrument for Private Credit. The interaction of Small Firm Share with Private Credit continues to enter positively and significantly.¹³

¹² In unreported regressions, we also tested whether the interaction between Private Credit and small firm share varies across industries with different degrees of external dependence. The triple interaction term does not enter significantly and the interactions of Private Credit with external dependence and the small firm share continue to enter significantly and positively, suggesting that small firms consistently face high financing constraints, irrespective of whether they are in an industry with a naturally high or low demand for external finance.

¹³ We have used alternative instrument sets, including latitude and settler mortality – proxying for initial endowments -, religious composition and ethnic fractionalization, factors that have been proposed by the literature as having a

The third and fourth robustness tests in Table 3 involve sampling. For three industries we had data on fewer than ten firms when computing the small firm share in the United States. In column 5, we exclude these three industries from the analyses (Tobacco, Petroleum Refineries, and Paper and Pulp). As shown, the results hold. Next, we were concerned that some industries played very little role in some countries. Including these in the analyses, therefore, may bias the results. Thus, for each country, we excluded industries below the median share of value added. These results are presented in Table 3 column 6. We continue to find that financial development exerts a particularly large impact on small firm industries.

IV.2. Sensitivity to Controlling for Different Industry Characteristics

There are a number of potential complications with using the United States as the benchmark country to identify the technological level of small firm share for each industry. In particular, Small Firm Share in the United States may be correlated with other industry-specific traits that interact with country-level characteristics to explain industry growth. This would produce spurious results.

As a sensitivity test, therefore, we include the interaction between financial development and different industry traits. First, as we have emphasized, the results are robust to controlling for the interaction of Private Credit with the RZ measure of external financial dependence. As a second concern, Claessens and Laeven (2003) show that industries that naturally use a high proportion of intangible assets grow faster in countries with strong private property rights protection. If small firms rely heavily on intangible assets and strong private property rights are closely associated with financial development, then our findings may simply be confirming the Claessens and Laeven

significant impact on financial and institutional development (Beck, Demirguc-Kunt and Levine, 2003, Easterly and Levine, 1997; Stulz and Williamson, 2004), and obtain similar results.

(2003) results rather than establishing a new channel linking financial development and economic growth. In Table 4 column 1, we therefore control for the interaction of Property Rights with the percentage of intangible assets in each industry. We use the ratio of intangible assets to fixed assets of U.S. firms over the period 1980 to 1989 calculated using data from Compustat. We confirm the Claessens and Laeven (2003) result: The interaction of Property Rights with Intangibility enters significantly and positively. However, this does not affect our main finding: Industries with a larger small firm share grow faster in economies with better-developed financial intermediaries.¹⁴

Third, we consider the possibility that industries classified as small-firm industries face different growth opportunities than industries composed of larger firms, which might lead us to spuriously link industrial firm size with faster economic growth in financial developed economies. Fisman and Love (2003) argue that financial development boosts the growth rate of industries with particularly good growth opportunities. Thus, we want to assess the independent importance of the relationship between industry growth and the interaction between financial development and Small Firm Share when controlling for cross-industry growth opportunities.¹⁵ Thus, in Table 4's column 2, we follow Fisman and Love (2003) and also include the interaction between Private Credit and their measure of industrial Sales Growth to control for growth opportunities. Sales Growth is calculated as real annual growth in net sales of U.S. firms over the period 1980 to 1989 using data from Compustat. Even when controlling for both external dependence and growth opportunities, the interaction of Small Firm Share with Private Credit enters positively and significantly.

¹⁴ Consistent with the view that small firms rely more on intangible assets, the correlation between Small Firm Share and Intangibility is 0.43 and significant at the five percent level. Nevertheless, even when controlling for the interaction of Small Firm Share and Intangibility, the results on financial development and Small Firm Share continue to hold. Furthermore, we tried an interaction of intangibility and financial development and obtained similar results.

¹⁵ There is not a strong correlation between Small Firm Share and sales growth. It is -0.08 and insignificant.

IV.3. Sensitivity to Controlling for Different Country Characteristics

There may also be concerns that financial development is highly correlated with other country-specific traits that interact with industry firm size and shape cross-industry growth rates. To examine the sensitivity of the results to different country factors, we choose country traits that on theoretical grounds are associated with financial development and influence industry firm size and growth (Greenwood and Jovanovic, 1990; Galor and Moav, 2005). Specifically, we include the interaction between Small Firm Share and country characteristics besides financial development.

Thus, in Table 4, we control for the interaction of (i) the log of GDP per capita with the Small Firm Share, (ii) average years of schooling with the Small Firm Share, (iii) openness to trade with the Small Firm Share, and (iv) the size of the economy as measured by GDP in 1980 with the Small Firm Share. Small firms might benefit from a generally more developed institutional environment. Thus, we include the overall level of economic development. If financial development is simply proxying for the overall level of institutional development, then including the interaction between Per Capita GDP and Small Firm Share should drive out the significance of the interaction between financial development and Small Firm Share. Similarly, a more educated population might be more conducive to the growth of industries composed of smaller (or larger) firms since technical, entrepreneurial, and managerial skills influence industrial organization and growth. If financial development is closely linked with human capital development, then controlling for the interaction between Small Firm Share and Human Capital (as measured by each country's average years of schooling of the population over the age of 25) should drive out the results on industrial small firm share. Finally, market size may be associated with financial development, industrial small firm share, and the growth rate of different industries. For instance, industries that depend on relatively large firms may grow faster in economies with larger markets that allow them to exploit economies

of scale more fully. To test this, we include (i) the interaction between Small Firm Share and a proxy measure of openness to international trade, Openness, which equals exports plus imports divided by GDP, and (ii) the interaction between Small Firm Share and the size of the economy, GDP.

The finding that financial development disproportionately boosts the growth of industries that are naturally composed of small firms holds even when controlling for these other country characteristics. The interaction of Private Credit with Small Firm Share enters positively and significantly in all of the Table 4 regressions. The interaction terms of Small Firm Share with per capita GDP enters negatively and significantly at the 10% level in column 4, but insignificantly in column 3, while the interactions with both openness to international trade and the size of the economy do not enter significantly in Table 4. The interaction of Human Capital and Small Firm Share enters positively and significantly at the 5% level in column 4, providing support to the view that small-firm industries grow faster in economies with more educated work forces. However, this does not affect the significance or size of the interaction term of Small Firm Share with Private Credit. Thus, this paper's core results on financial development, industrial small firm share, and industry growth are robust to controlling for different country characteristics.

Finally, but critically, we were concerned that financial market frictions might be highly correlated with regulatory impediments to labor mobility and new firm formation. If this is the case and we do not control for these other frictions, we might inappropriately interpret the results as applying to finance when they really apply to other distortions. For instance, Klapper, Laeven, and Rajan (2005) find that new firms are disproportionately hurt by regulatory impediments to labor mobility and high entry barriers. Thus, in columns 6 and 7 of Table IV, we introduce the interaction terms of small firm share with labor market restrictions and entry restrictions, respectively. Both of

these interaction terms enter significantly. We find that regulatory impediments in labor markets and regulatory restrictions on the entry of new firms exert a particularly negative impact on small firm industries. However, even when including these additional controls, the results indicate that financial development has a disproportionately positive effect on small firm industries.

IV.4. Sensitivity to Alternative Measures of Industrial Small Firm Share

Table 5 indicates that the results are robust to using alternative definitions of Small Firm Share. In all of these regressions, we control for the interaction between financial development and external dependence. We use four different cut-offs to define a small firm: 5, 10, 100 and 500 employees respectively.¹⁶ Table 1 lists Small Firm Share for the different definitions of a small firm. There is a high correlation among the different measures of Small Firm Share, and the average correlation is 91%.¹⁷ Nevertheless, some additional information may be garnered from examining the results with different cut-offs. This allows us to (a) test the robustness of the results to different definitions of a small firm and (b) assess more fully the relationship between cross-industry firm size, financial development, and growth.

Using the alternative definitions of a small firm does not change our main finding: Financial development fosters the growth of small-firm industries more than large-firm industries, though the significance of the interaction term between Private Credit and Small Firm Share is significant only at the ten percent level when defining a small firm as having 100 or fewer employees. We also find that once we include firms up to 500 employees in the definition of Small Firm Share, then the interaction of financial development and firm size distribution turns insignificant. Thus, these sensitivity checks (i) emphasize that financial development exerts a particularly large growth effect

¹⁶ Note that we lose two industries due to missing data in the U.S. Census when we use 5 and 10 employees as cut-off.

on small-firm industries and (ii) indicate “small-firm” industries that enjoy a disproportionately large growth effect from financial include industries with a large share of firms with less than 100 employees.

We also find that the economic size of the impact of financial development on industries with different Small Firm Shares is robust to using different definitions of small firm share. Specifically, using the example above, moving from India (25th percentile Private Credit) to Canada (75th percentile Private Credit) benefits the industry at the 75th percentile of Small Firm Share relatively more than the industry at the 25th percentile of Small Firm Share. According to the estimated coefficients, this change induces a 1.4% growth differential between these two types of industries using 20 employees as the cut-off definition for a small firm. For example, the growth differentials are virtually identical (1.6% and 1.5 % growth differential respectively) when using 10 or 5 employees as alternative definitions of small firm in categorizing the technological level of small firm share. Given that we control for the interaction of financial development with external financial dependence, these results suggest that small-firm industries benefit more than large-firm industries from financial development.

Next, we were concerned that using indicators of Small Firm Share that are measured after the dependent variable would induce biases. While we cannot measure Small Firm Share in earlier periods due to the data constraints discussed above, we can assess whether Small Firm Share is stable and then see whether using Small Firm Share from a different year alters the results. The correlation between the small firm shares in 1992 and 1997 using the 20-employee cut-off is 90%, significant at the 1% level, and the Spearman rank correlation is 92%.¹⁸ This suggests that firm size distribution across industries in the United States is persistent and does not vary significantly over

¹⁷ Not surprisingly, the correlation decreases as we move towards higher thresholds. The correlation between S5 and S10 is 99%, but 78% between S5 and S500.

the business cycle (in 1992, the U.S. economy was just emerging from a recession, while 1997 was a boom year).

Moreover, this paper's findings are also robust to measuring Small Firm Share for U.S. industries in 1997 instead of 1992. Columns (1) and (2) of Table 6 report the results when using the Small Firm Share across U.S. industries when using the 1997 Census and 10 or 20 employees as the cut-off. Using the 1997 data does not change our findings: the interaction of the Small Firm Share with Private Credit enters positively and significantly at the 1% level.

IV.5. Sensitivity to Alternative Benchmark Countries and Controlling for Median Firm Size

There may be concerns that the results are driven by the choice of the United States as the benchmark country. From this perspective, the United States have particular production technologies or distortions that yield different industry firm size traits. While it is unclear why this would produce the particular patterns documented above, we also conducted the analyses using different benchmark countries.

As shown in Table 6, the results hold when using the United Kingdom, Germany, or France as the benchmark economy for computing each industry's technological small firm share. We use AMADEUS data for 1997 to calculate the small firm share across industries for these countries. AMADEUS is a commercial database maintained by Bureau Van Dijk containing financial statements and employment data for over 5 million firms in Europe. Unfortunately, the data on industrial firm size distribution is not as complete as the data for the United States.¹⁹ Nevertheless,

¹⁸ Annex Table 2 lists the Small Firm Share for different cut-offs for 1997.

¹⁹ Unlike for the U.S. Census, for the Amadeus dataset we only have complete data for enterprises above 10 employees so that our small firm share for European countries is calculated as employment in enterprises between 10 and 20 employees relative to employment in enterprises with more than 10 employees. We only include limited liability companies in our calculations, since in most European countries unlimited liability companies are not required to file financial accounts (for further details, see Klapper, Laeven, and Rajan, 2004). Also, we exclude industries with less than

we continue to find that small-firm industries grow faster in countries with well-developed financial systems. The interaction of Small Firm Share in the United Kingdom, Germany, and France and Private Credit enters positively and significantly at the 5% level (Table 6 columns 3, 4, and 5), which again confirms this paper's core conclusion. Importantly, if we choose a country with a severely distorted distribution of firm sizes as the benchmark country, then this would not provide a good proxy for the technological small firm share of each country and we should therefore not expect to obtain significant results. To test this, we choose Romania, which is a country that is still in a turbulent, transitional state with regard to industrial structure.²⁰ Consistent with our expectation, we do not find significant results with Romania as the benchmark country (column 6). In sum, the results using different benchmark countries to identify the small firm share of each industry confirm this paper's findings.

As an additional sensitivity test, we also control for the interaction of financial development and a measure of the median firm size of an industry based on the U.S. Census data in 1980 (Median Size). To compute Median Size, we use U.S. Census data (which is provided in terms of "bins" of firms by the number employees, e.g., less than 10, between 10 and 19, etc.). We then identify the bin that accounts for the median employee. For this bin, we calculate the average size firm as the total number of employees in this bin divided by the number of firms in this bin (see Table 1 for estimates of the Median Size of each industry). Thus, besides including the interaction between Small Firm Share and Private Credit, we also include the interaction of Median Size and Private Credit. As discussed above, industries might have the same median firm size, but very different small firm shares. In the extreme case, if industry A consists of firms of equal size, and

20 firm-observations. The correlation between the small firm shares for industries in the U.S. in 1992 and small firm shares in the U.K. in 1997 is 58%, significant at the 1% level and the Spearman rank correlation is 52%.

²⁰ We choose Romania, and not another transition economy, because Romania has the broadest coverage of firms of all the transition countries included in the AMADEUS database.

industry B consists of firms with size equally distributed around the median size of firms in industry A, then both industries would have the same median firm size, yet the share of small firms is positive in industry B and zero in industry A (assuming that the median is above the definition of a small firm). Since we are examining whether small firms face tighter financing constraints than large firms, we want to focus on the technological share of small firms in an industry, not on the median firm size. By simultaneously controlling for the median size of each industry, we test this. Thus, if small firms are driving this paper's results, we should find that the interaction between Small Firm Share and Private Credit remains significantly correlated with industry growth when controlling for the interaction of Median Size with Private Credit. This is exactly what we find. Table 6 (columns 7 and 8) shows that after controlling for the interaction between Median Size and Private Credit, the relationship between industry growth and the interaction between Small Firm Share and Private Credit is significant at the one percent level and the coefficient size is essentially unchanged. The interaction term between Private Credit and Median Size, on the other hand, does not enter significantly. These robustness tests further indicate that financial development exerts a disproportionately positive impact on industries that are heavily composed of small firms for technological reasons.

The results are also robust to controlling for the median size of *large* firms in each industry. We were concerned that industry variation in the size of the largest firms could reflect U.S. specific factors and distort our results. Thus, we controlled for the median size of the large, listed firms by industry in the United States, using Compustat data to calculate the log of the median number of employees across large, listed firms in the United States. We refer to this size variable as Industry Size US. The interaction of Private Credit with the median firm size of large, listed firms enters

marginally significantly (Table 6 column 9).²¹ Importantly, we continue to find that the interaction of Private Credit and Small Firm Share enters positively and significantly at the 5% level.

IV.6. Sensitivity to Alternative Measures of Financial Development

The findings are also robust to using alternative measures of financial development as shown in Table 7. First, we use Private Credit, averaged over the period 1980 to 1989 instead of using the value in the initial year. While using the average value may introduce a bias in our estimates, the interaction with the Small Firm Share enters positively and significantly at the 1% level, and the coefficient is only slightly higher than when using the initial value (regression 1).

Second, we use Liquid Liabilities, which equals the liquid liabilities of the financial system (currency plus demand and interest-bearing liabilities of banks and nonbank financial intermediaries) divided by GDP. Unlike Private Credit, Liquid Liabilities simply measures the size financial intermediaries and does not focus on the intermediation of credit to the private sector. As shown in Table 7 regression 2, the results hold when using Liquid Liabilities.²²

Third, we test whether small-firm industries grow faster in economies with more active stock markets. Market Turnover equals the ratio of the value of stock transactions divided by market capitalization for each country's stock exchange. While the interaction with the Small Firm Share is positive, it is not significant (Table 7 regression 3). This suggests that, consistent with Petersen and Rajan (1995), small firms benefit more from services provided by financial intermediaries than services provided by stock markets.²³

²¹ The interaction of Private Credit with the median firm size of large U.S. firms loses significance when we control for the interaction of Private Credit and Small Firm Share when defining a small firm as having 10 or fewer employees.

²² These results also hold when using assets of deposit money banks divided by assets of deposit money banks plus central bank assets from Levine, Loayza and Beck (2000) as a measure of financial development.

²³ These results hold when using stock market capitalization and value traded as alternative stock market indicators.

Fourth, we use several indicators that do not directly measure the size or efficiency of the financial system, but instead measure the institutional foundations for financial development. Specifically, we also use Legal Efficiency, which measures the efficiency and integrity of a country's legal environment. Data are averaged over 1980-83 and are originally from Business International Corporation. Also, we use the Law and Order index compiled by ICRG, which is based on survey data that seek to elicit the degree of trust that citizens have in the legal system's ability to resolve disputes. Finally, we use Accounting Standards, which measures the number of items listed on firms' financial statements, an indicator ranging from zero to 90 and compiled by CIFAR. Accounting Standards is a proxy for the quality of financial information about firms and has been used by RZ as a proxy for financial development. As shown in Table 7, the interaction between Legal Efficiency and Small Firm Share and the interaction between the Law and Order and Small Firm Share both enter positively and significantly at the 5% level (columns 4 and 5). The interaction of Accounting Standards with Small Firm Share, however, enters insignificantly (column 6). This suggests that the quality of financial statements does not foster disproportionately faster growth in small-firm industries. This finding is consistent with the insignificant result for the interaction of Turnover with Small Firm Share and emphasizes the particularly large, positive relationship between the development of financial intermediaries and the growth rate of industries that are naturally composed of small firms. While it is not direct evidence, this result is consistent with arguments that small firms rely on financial intermediaries to obtain information on the firm through means other than publicly available financial statements (such as information deriving from long-term bank-firm relationships), so that financial intermediary development induces a particularly large, positive effect on small firm industries.

Finally, we also use a survey based measure of firm financing constraints. Specifically, the World Business Economic Survey (WBES) conducted a survey of firms around the world in 1999 and obtained information on various constraints to firm growth. The WBES surveyed firms of all sizes across 80 countries. For our robustness tests, we use the answer to one question from this survey: “How problematic is financing for the operation and growth of your business?” Answers vary between 1 (no obstacle), 2 (a minor obstacle), 3 (a moderate obstacle), or 4 (a major obstacle)? We take the average of these answers across firms within each country and use this as an indicator of national financial development, where larger values imply lower financial development. There are problems with averaging across firms within a country because each country may have different types of firms in terms of ownership, size, industrial composition etc. Nevertheless, we included this measure as an additional robustness check. As shown in Table 7 (column 7), the results hold when using this alternative financial development indicator: financing constraints induce a disproportionately adverse effect on small firm industries.

IV.7. Sensitivity to Alternative Sampling Period

As a robustness test, we use industry value added growth over an extended period, 1980 through 1999. The core sample includes 1242 country-industry observations for the period 1980 to 1990 (the original RZ sample). When we move to the extended period, the sample drops by one-third to only 827 country-industry observations because we lose data on several countries and industries.

Nevertheless, the results in Table 8 indicate that our main findings are robust to calculating industry growth over this longer period. The results in columns 1 and 2 confirm a significant and positive coefficient on the interaction of Small Firm Share and financial development when using

(i) industry growth rates over the period 1980-99 and (ii) defining Small Firm Share with either the 10 or 20 employees cut-off. The regression in column 3 suggests that the significance over the longer period is not due to the reduced sample because the results for the 1980s also hold for the smaller sample for which we have data through 1999.

V. Conclusions

This paper finds that financial development boosts the growth of industries that are naturally composed of small firms more than large-firm industries. This result is robust to controlling for other industry characteristics, many country traits, different measures of financial development, various methods for computing the technological firm size of industries, and alternative estimation samples.

This result has three interrelated implications. First, this paper contributes to the literature on the mechanisms through which financial development boosts aggregate economic growth. Although a large literature shows that there is a strong positive relationship between financial development and economic growth, it is crucial to dissect the channels connecting finance and growth to (i) better understand the finance-growth nexus and (ii) assess whether finance causes growth, or whether financial development is simply a characteristic of successful economies. Past work suggests that financial development facilitates economic growth by boosting the growth of firms that rely heavily on external finance. Besides confirming this finding, we show that financial development fosters economic growth by relieving constraints on the growth of small firm industries. Thus, we identify an additional mechanism through which financial development fosters aggregate economic growth. Second, this paper's findings support the view that financial development disproportionately boosts the growth of small firms relative to large firms. Some theories of the firm argue that financial development is particularly beneficial to large firms. Others predict that financial development is

especially important for lowering transaction costs and informational barriers that hinder small firm growth. Our findings support the view that under-developed financial systems are particularly detrimental to the growth of firms with less than 100 employees. Finally, we find that financial development has cross-industry distributional consequences. Although we do not examine specific policies, the results suggest that policies that improve the operation of the financial system will tend to boost the growth of small-firm industries more than large firm industries.

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Table 1 Firm Size Distribution in the United States in 1992

This table shows employment shares by firm size bin in the United States by ISIC Revision 2 industries. S_x is the industry's share of employment by firms with less than x employees, and is calculated using data from the U.S. Census on all U.S. firms for the year 1992. Median Size is the average firm size in the bin of the median worker, and is calculated using data from the U.S. Census on all U.S. firms for the year 1992. Employment shares are expressed in percentages of total number of employees.

ISIC	Industry name	S5	S10	S20	S100	S500	Median Size
311	Food manufacturing	0.56	1.68	3.82	13.77	28.71	13.55
313	Beverage industries	0.60	1.76	4.04	14.75	30.66	13.93
314	Tobacco manufactures	0.09	0.20	0.30	1.49	5.14	44.75
321	Manufacture of textiles	0.40	1.17	2.81	13.43	32.95	13.99
322	Manufacture of wearing apparel, except footwear	1.30	3.60	8.18	31.74	58.39	6.70
323	Manufacture of leather and products of leather	1.94	4.78	10.45	36.89	61.08	6.72
324	Manufacture of footwear	0.31	0.81	1.61	7.40	30.89	13.90
331	Manufacture of wood and wood and cork products	4.20	11.20	21.37	47.31	67.42	6.67
332	Manufacture of furniture and fixtures	1.57	4.19	9.09	28.74	50.78	6.68
341	Manufacture of paper and paper products			3.03	16.16	33.60	44.15
342	Printing, publishing and allied industries	3.64	9.16	16.32	35.80	51.65	6.60
352	Manufacture of other chemical products	0.87	2.68	5.80	17.67	31.53	13.57
353	Petroleum refineries	0.05	0.18	0.36	1.90	5.67	131.17
354	Manufacture of miscellaneous products of petroleum and coal	1.26	3.93	9.26	29.80	52.11	13.04
355	Manufacture of rubber products	0.38	1.21	3.15	13.23	27.46	13.99
356	Manufacture of plastic products not elsewhere classified	0.69	2.24	6.09	27.19	54.98	13.90
361	Manufacture of pottery, china and earthenware	2.30	4.91	8.80	26.52	41.71	2.05
362	Manufacture of glass and glass products	1.15	2.82	5.05	13.92	24.41	6.69
369	Manufacture of other non-metallic mineral products	1.87	5.88	14.17	40.78	60.42	13.55
371	Iron and steel basic industries	0.20	0.59	1.62	8.05	23.38	44.62
372	Non-ferrous metal basic industries	0.50	1.78	4.76	18.65	37.07	14.05
381	Manufacture of fabricated metal products	1.28	4.07	9.98	33.87	55.62	13.76
382	Manufacture of machinery except electrical	2.15	6.37	13.68	34.60	50.87	6.75
383	Manufacture of electrical machinery apparatus, and appliances	0.50	1.48	3.44	14.18	28.97	13.78
384	Manufacture of transport equipment	0.18	0.54	1.21	4.20	8.15	13.56
385	Manufacture of professional and scientific equipment	0.68	1.87	4.01	12.88	25.74	6.69
390	Other Manufacturing Industries	3.54	8.72	16.95	43.48	66.66	6.63
3211	Spinning, weaving and finishing textiles	0.26	0.73	1.91	9.14	24.54	44.77
3411	Manufacture of pulp, paper and paperboard			0.14	1.29	7.27	183.80
3511	Manufacture of basic industrial chemicals except fertilizers	0.29	0.89	1.75	6.51	12.90	13.57
3513	Manufacture of synthetic resins, plastic materials and fibers	0.11	0.31	0.66	3.17	8.41	44.07
3522	Manufacture of drugs and medicines	0.26	0.86	2.10	8.09	18.46	13.82
3825	Manufacture of office, computing and accounting machinery	0.48	1.32	2.85	10.43	21.67	13.54
3832	Manufacture of radio, television and communication equipment	0.57	1.40	3.09	11.67	27.85	13.59
3841	Ship building and repairing	1.73	3.58	6.56	16.35	30.26	2.08
3843	Manufacture of motor vehicles	0.32	1.00	2.28	8.04	17.62	13.70
Average		1.07	2.88	5.85	18.42	33.75	23.57

Table 2 Summary Statistics

This table reports summary statistics for the main variables in our analysis. Country-industry variables: Growth in real value added is average growth in real value added over the period 1980-1989 by country and ISIC industry. Share in value added is the industry's share in total value added of the country's manufacturing sector. Industry variables: Small firm share (empl<x) is the industry's share of employment by firms with less than x employees, and is calculated using data from the U.S. Census on all U.S. firms for the year 1992. External financial dependence is a measure of the industry's dependence on external finance, from Rajan and Zingales (1998). Intangibility is a measure of the industry's dependence on intangible assets from Claessens and Laeven (2003). Sales growth is an industry measure of sales growth from Fisman and Love (2003). Median Size is the average firm size in the bin of the median worker, and is calculated using data from the U.S. Census on all U.S. firms for the year 1992. Industry size in US is the logarithm of the industry's median number of employees, and is calculated using data for the year 1980 on U.S. listed firms from Compustat. UK Small firm share is the industry's share of employment by firms with less than 20 employees, and is calculated using firm-level data from Amadeus on all U.K. limited liability firms with 10 or more employees for the year 1997 (we exclude industries with less than 20 firm-observations). Country variables: Private Credit is claims by financial institutions on the private sector divided by GDP in 1980. Liquid liabilities is liquid liabilities to GDP in 1980. Market turnover is total value of trades to total value of shares averaged in 1980. Per capita GDP is the logarithm of the country's real GDP per capita in 1980. Accounting standards is an index of the quality of accounting standards in 1990. Legal efficiency is the measure of the country's efficiency of the legal system used by LLSV (1998), and is an average for the years 1980-1983. Law and order is an index of the law and order tradition in the country from LLSV (1998), and is an average for the years 1982-1995. Property rights is a measure of the country's protection of property rights from the Heritage Foundation. Average for the years 1995-99. Human capital is average years of schooling in population age over 25 in the year 1980. Financing obstacles is the country-average of firm financing obstacles in 1999 from WBES.

Variable	Mean	Median	St.dev.	Minimum	Maximum
Panel A: Country-industry variables					
Growth in real value added	0.034	0.029	0.099	-0.447	1.000
Share in value added	0.016	0.009	0.021	0.000	0.224
Panel B: Industry variables					
Small firm share (empl<5)	0.011	0.006	0.011	0.001	0.042
Small firm share (empl<10)	0.029	0.018	0.027	0.002	0.112
Small firm share (empl<20)	0.059	0.039	0.053	0.001	0.214
Small firm share (empl<100)	0.184	0.14	0.13	0.013	0.473
Small firm share (empl<500)	0.337	0.305	0.183	0.051	0.674
External financial dependence	0.319	0.231	0.406	-0.451	1.492
Intangibility	0.625	0.460	0.810	0.020	4.540
Sales growth	0.045	0.042	0.037	-0.037	0.129
Median size	23.572	13.600	35.733	2.000	183.800
Industry size in US	2.309	1.225	2.649	0.250	10.60
UK Small firm share	0.010	0.009	0.009	0.000	0.037
Panel C: Country variables					
Private Credit	0.425	0.341	0.270	0.073	1.173
Liquid liabilities	0.487	0.447	0.234	0.142	1.342
Market turnover	0.157	0.109	0.164	0.001	0.712
Per capita GDP	7.791	7.860	1.334	4.793	9.573
Human capital	5.811	5.313	2.853	1.681	12.141
Property rights	3.966	4.000	0.879	2.000	5.000
Accounting standards	0.613	0.620	0.132	0.240	0.830
Legal efficiency	7.704	7.375	2.012	2.500	10.000
Law and order	6.692	6.575	2.770	1.900	10.000
Financing obstacles	2.575	2.593	0.421	1.691	3.267

Table 3 Financial Development, Small Firm Share, and Growth

Dependent variable is average growth in real value added over the period 1980-1990 by country and ISIC industry. Share in value added is the industry's share in total value added of the country's manufacturing sector. Private Credit is claims by financial institutions on the private sector divided by GDP in 1980. Small firm share is the industry's share of employment by firms with less than 20 employees, and is calculated using data from the U.S. Census on all U.S. firms for the year 1992. External dependence is a measure of the industry's dependence on external finance, from Rajan and Zingales (1998). The industry measures are based on U.S. data. The standard errors in regression (3) are adjusted for clustering at the industry-level. The regression in column (4) is estimated using legal origin dummies as instrumental variable for Private Credit. The OLS regression in column (5) excludes industries with less than 10 firms in each size bucket; these are: Tobacco (ISIC 314), Petroleum refineries (ISIC 353), and Pulp and paper (ISIC 3411). The regression in column (6) excludes industries below the median initial industry share in value added for each country. All regressions include country and industry dummies, but these are not reported. Robust standard errors in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%.

	(1) OLS	(2) OLS	(3) OLS with clustering	(4) IV	(5) Excluding industries with poor coverage	(6) Excluding industries with low share
Share in value added	-1.012*** (0.253)	-1.095*** (0.253)	-1.095*** (0.287)	-1.086*** (0.253)	-1.148*** (0.282)	-0.764*** (0.209)
Private Credit * Small firm share	0.409** (0.172)	0.445** (0.173)	0.445** (0.187)	0.567** (0.220)	0.567*** (0.194)	0.644*** (0.190)
Private Credit * External dependence		0.144*** (0.039)	0.144*** (0.037)	0.101*** (0.037)	0.166*** (0.043)	0.130*** (0.040)
Observations	1242	1242	1242	1242	1147	638
R-squared	0.26	0.28	0.28	0.27	0.29	0.52

Table 4 Controlling for Additional Industry and Country Characteristics

Dependent variable is average growth in real value added over the period 1980-1990 by country and ISIC industry. Share in value added is the industry's share in total value added of the country's manufacturing sector. Private Credit is claims by financial institutions on the private sector divided by GDP in 1980. Property rights is a measure of the country's protection of property rights from the Heritage Foundation. Average for the years 1995-99. We reverse the original order of the index such that higher values indicate more protection (score of 1-5). Small firm share is the industry's share of employment by firms with less than 20 employees, and is calculated using data from the U.S. Census on all U.S. firms for the year 1992. External financial dependence is a measure of the industry's dependence on external finance, from Rajan and Zingales (1998). Intangibility is a measure of the industry's dependence on intangible assets from Claessens and Laeven (2003), and is calculated as the ratio of intangible assets to fixed assets of U.S. firms over the period 1980 to 1989 using data from Compustat. Sales growth is an industry measure of sales growth from Fisman and Love (2003), and is calculated as real annual growth in net sales of U.S. firms over the period 1980 to 1989 using data from Compustat. Per capita GDP is the logarithm of the country's real GDP per capita in 1980. GDP is the level of the country's GDP in 1980 (in US dollars). Human capital is average years of schooling in population age over 25 in the year 1980. Labor regulation is the labor regulation index from Botero et al. (2003). A higher score denotes stricter labor regulations. Entry barriers is the cost of entry regulations as a share of per capita GDP in 1999 from Djankov et al (2002). A higher score denotes more costly entry regulations. Openness is the sum of exports and imports relative to GDP in 1980. The industry measures are based on U.S. data. We include country and industry dummies, but these are not reported. Robust standard errors in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Share in value added	-1.114*** (0.255)	-1.108*** (0.255)	-1.089*** (0.258)	-0.955*** (0.253)	-1.155*** (0.265)	-1.093*** (0.259)	-0.809*** (0.204)	0.390** (0.151)
Private Credit * Small firm share	0.356** (0.167)	0.468*** (0.176)	0.485** (0.190)	0.457** (0.186)	0.500*** (0.188)	0.543** (0.240)	0.534*** (0.187)	0.115*** (0.030)
Private Credit * External financial dependence	0.139*** (0.038)	0.092** (0.040)	0.143*** (0.039)	0.121*** (0.037)	0.141*** (0.039)	0.143*** (0.039)	0.109*** (0.030)	0.390** (0.151)
Property rights * Intangibility	0.008*** (0.003)							
Private Credit * Sales growth		0.774* (0.425)						
Per capita GDP * Small firm share			-0.013 (0.043)	-0.156* (0.081)	-0.012 (0.046)	-0.012 (0.043)	0.008 (0.040)	-0.048 (0.047)
Human capital * Small firm share				0.071** (0.028)				
Openness * Small Firm share					0.000 (0.002)			
GDP * Small firm share						-0.000 (0.000)		
Labor regulation * Small firm share							-0.205** (0.087)	
Entry barriers * Small firm share								-0.665** (0.288)
Observations	1242	1242	1242	1207	1215	1242	1184	1184
R-squared	0.28	0.28	0.28	0.30	0.27	0.28	0.32	0.33

Table 5 Alternative Measures of Firm Size Distribution

Dependent variable is average growth in real value added over the period 1980-1990 by country and ISIC industry. Share in value added is the industry's share in total value added of the country's manufacturing sector. Private Credit is claims by financial institutions on the private sector divided by GDP in 1980. Small firm share (empl<x) is the industry's share of employment by firms with less than x employees, and is calculated using data from the U.S. Census on all U.S. firms for the year 1992. External financial dependence is a measure of the industry's dependence on external finance, from Rajan and Zingales (1998). The industry measures are based on U.S. data. We include country and industry dummies, but these are not reported. Robust standard errors in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%.

	(1)	(2)	(3)	(4)	(5)
Share in value added	-1.134*** (0.265)	-1.139*** (0.266)	-1.095*** (0.253)	-1.076*** (0.251)	-1.055*** (0.249)
Private Credit * Small firm share (empl<5)	2.807*** (0.911)				
Private Credit * Small firm share (empl<10)		1.141*** (0.353)			
Private Credit * Small firm share (empl<20)			0.445** (0.173)		
Private Credit * Small firm share (empl<100)				0.130* (0.072)	
Private Credit * Small firm share (empl<500)					0.045 (0.051)
Private Credit * External financial dependence	0.154*** (0.040)	0.153*** (0.040)	0.144*** (0.039)	0.142*** (0.039)	0.141*** (0.038)
Observations	1170	1170	1242	1242	1242
R-squared	0.28	0.28	0.28	0.27	0.27

Table 6 Alternative Small Firm Data and Controlling for the Size of Large Firms

Dependent variable is average growth in real value added over the period 1980-1990 by country and ISIC industry. Share in value added is the industry's share in total value added of the country's manufacturing sector. Private Credit is claims by financial institutions on the private sector divided by GDP in 1980. External financial dependence is a measure of the industry's dependence on external finance, from Rajan and Zingales (1998). Small firm share is the industry's share of employment by firms with less than 20 employees, and is calculated using data from the U.S. Census on all U.S. firms for the year 1992. Small firm share (empl<x) in 97 is the industry's share of employment by firms with less than x employees, and is calculated using data from the U.S. Census on all U.S. firms for the year 1997. Small firm share in other countries is the industry's share of employment by firms with less than 20 employees, and is calculated using firm-level data from Amadeus on all limited liability firms in each country with 10 or more employees for the year 1997 (we exclude industries with less than 20 firm-observations). Median Size is the log of the average firm size (in terms of employees) in the bin where the median worker is located, and is calculated using data from the U.S. Census on all U.S. firms for the year 1992. Industry size in US is the log of the median number of employees across all U.S. listed firms in Compustat. The industry measures are based on U.S. data. We include country and industry dummies, but these are not reported. Robust standard errors in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Share in value added	-1.146*** (0.273)	-1.129*** (0.292)	-1.055*** (0.259)	-1.077*** (0.262)	-1.042*** (0.259)	-1.048*** (0.293)	-1.041*** (0.250)	-1.088*** (0.255)	-1.079*** (0.255)
Private Credit * External financial dependence	0.157*** (0.041)	0.191*** (0.048)	0.153*** (0.042)	0.157*** (0.042)	0.166*** (0.043)	0.150*** (0.043)	0.140*** (0.038)	0.155*** (0.039)	0.175*** (0.044)
Private Credit * Small firm share								0.660*** (0.198)	0.603*** (0.198)
Private Credit * Small firm share (empl<20) in 97	0.685*** (0.249)								
Private Credit * Small firm share (empl<10) in 97		1.522*** (0.507)							
Private Credit * Small firm share in UK			1.696** (0.827)						
Private Credit * Small firm share in Germany				0.655*** (0.250)					
Private Credit * Small firm share in France					0.484** (0.218)				
Private Credit * Small firm share in Romania						0.028 (0.205)			
Private Credit * Median Size							-0.000 (0.013)	0.022 (0.015)	
Private Credit * Industry size in US									0.020* (0.012)
Observations	1102	1005	1180	1180	1180	1028	1242	1242	1242
R-squared	0.28	0.29	0.28	0.28	0.28	0.29	0.27	0.28	0.28

Table 7 Alternative Measures of Financial Development

Dependent variable is average growth in real value added over the period 1980-1990 by country and ISIC industry. Share in value added is the industry's share in total value added of the country's manufacturing sector. Private credit 1980-89 is the country's private credit to GDP averaged over the period 1980-89. Liquid liabilities is liquid liabilities to GDP in 1980. Market turnover is total value of trades to total value of shares in 1980. Legal efficiency is the measure of the country's efficiency of the legal system used by LLSV (1998), and is an average for the years 1980-1983. Law and order is an index of the law and order tradition in the country from LLSV (1998), and is an average for the years 1982-1995. Accounting standards is an index of the quality of accounting standards in 1990. Financing obstacles is the country-average of firm financing obstacles in 1999 from WBES. Small firm share is the industry's share of employment by firms with less than 20 employees, and is calculated using data from the U.S. Census on all U.S. firms for the year 1992. External financial dependence is a measure of the industry's dependence on external finance, from Rajan and Zingales (1998). The industry measures are based on U.S. data. We include country and industry dummies, but these are not reported. Robust standard errors in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Share in value added	-1.127*** (0.255)	-1.043*** (0.251)	-1.020*** (0.257)	-0.794*** (0.195)	-0.827*** (0.210)	-0.669*** (0.209)	-1.462*** (0.341)
Private credit 1980-89 * Small firm share	0.444*** (0.161)						
Private credit 1980-89 * External financial dependence	0.097*** (0.025)						
Liquid liabilities * Small firm share		0.399** (0.184)					
Liquid liabilities * External financial dependence		0.085*** (0.032)					
Market turnover * Small firm share			0.018 (0.234)				
Market turnover * External financial dependence			0.074** (0.036)				
Legal efficiency * Small firm share				0.053*** (0.020)			
Legal efficiency * External financial dependence				0.009*** (0.003)			
Law and order * Small firm share					0.053*** (0.020)		
Law and order * External financial dependence					0.007*** (0.002)		
Accounting standards * Small firm share						0.363 (0.244)	
Accounting standards * External financial dependence						0.158*** (0.034)	
Financing obstacles * Small firm share							-0.423** (0.167)
Financing obstacles * External financial dependence							-0.060*** (0.019)
Observations	1242	1242	1222	1174	1174	1067	838
R-squared	0.27	0.27	0.26	0.31	0.31	0.35	0.27

Table 8 Alternative Dependent Variable: Growth over the Period 1980-99

Dependent variable in columns (1) to (2) is average growth in real value added over the period 1980-1999 by country and ISIC industry. Dependent variable in columns (3) is average growth in real value added over the period 1980-1990 by country and ISIC industry. Share in value added is the industry's share in total value added of the country's manufacturing sector. Private Credit is claims by financial institutions on the private sector divided by GDP in 1980. Small firm share (empl<x) is the industry's share of employment by firms with less than x employees, and is calculated using data from the U.S. Census on all U.S. firms for the year 1992. External financial dependence is a measure of the industry's dependence on external finance, from Rajan and Zingales (1998). The sample in column (3) is restricted to those observations that take non-missing values for the average growth in real value added over the period 1980-1999 variable. The industry measures are based on U.S. data. We include country and industry dummies, but these are not reported. Robust standard errors in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%.

	(1) Growth over 1980 to 1999	(2) Growth over 1980 to 1999	(3) Growth over 1980 to 1990
Share in value added	-0.330 (0.224)	-0.334 (0.221)	-1.293*** (0.306)
Private Credit * Small firm share (empl<20)	0.249* (0.141)		0.852*** (0.265)
Private Credit * Small firm share (empl<10)		0.568** (0.258)	
Private Credit * External financial dependence	0.067** (0.032)	0.070** (0.032)	0.107** (0.046)
Observations	827	805	827
R-squared	0.33	0.33	0.31

Annex Table 1 Financial Development across Countries

Private Credit is claims by financial institutions on the private sector divided by GDP in 1980. Private Credit 1980-89 is claims by financial institutions on the private sector divided by GDP averaged over the years 1980 to 1989.

Country	Private Credit	Private Credit 1980-89
Australia	0.266	0.337
Austria	0.711	0.780
Bangladesh	0.073	0.140
Belgium	0.252	0.280
Brazil	0.257	0.236
Canada	0.670	0.680
Chile	0.308	0.478
Colombia	0.252	0.251
Costa Rica	0.264	0.186
Denmark	0.365	0.415
Egypt	0.178	0.278
Finland	0.430	0.561
France	0.971	0.891
Germany	0.830	0.898
Greece	0.476	0.454
India	0.233	0.273
Indonesia	0.078	0.156
Israel	0.517	0.491
Italy	0.527	0.494
Jamaica	0.214	0.273
Japan	1.173	1.362
Jordan	0.475	0.593
Kenya	0.317	0.304
Korea, Rep. of	0.483	0.616
Malaysia	0.435	0.677
Mexico	0.167	0.122
Morocco	0.237	0.210
Netherlands	0.929	1.046
New Zealand	0.233	0.336
Nigeria	0.109	0.169
Norway	0.750	0.794
Pakistan	0.212	0.238
Peru	0.094	0.110
Philippines	0.384	0.292
Portugal	0.760	0.710
Singapore	0.720	0.919
South Africa	0.382	0.464
Spain	0.726	0.722
Sri Lanka	0.183	0.184
Sweden	0.834	0.938
Turkey	0.163	0.152
United Kingdom	0.260	0.550
Venezuela	0.503	0.503
Zimbabwe	0.286	0.205
Average	0.425	0.473

Annex Table 2 Firm Size Distribution in the United States in 1997

This table shows SME shares in the United States by ISIC Revision 2 industries. Sx is the industry's share of employment by firms with less than x employees, and is calculated using data from the U.S. Census on all U.S. firms for the year 1997. SME shares are expressed in percentages of total number of employees.

ISIC	Industry name	S5	S10	S20	S100	S500
311	Food manufacturing	0.53	1.61	3.68	13.01	27.01
313	Beverage industries	0.80	2.22	4.70	16.38	33.29
314	Tobacco manufactures			0.55	3.03	9.02
321	Manufacture of textiles	0.44	1.23	2.95	13.29	30.57
322	Manufacture of wearing apparel, except footwear	1.53	4.40	10.04	34.42	57.26
323	Manufacture of leather and products of leather, leather substitutes and fur, except footwear and wearing apparel			10.17	31.95	57.93
324	Manufacture of footwear, except vulcanized or molded rubber or plastic footwear	0.52	1.18	2.18	10.29	31.54
331	Manufacture of wood and wood and cork products, except furniture	3.80	9.90	19.50	43.78	63.82
332	Manufacture of furniture and fixtures, except primarily of metal	1.39	3.92	8.62	28.53	50.69
341	Manufacture of paper and paper products					32.16
342	Printing, publishing and allied industries	3.24	8.27	15.08	34.47	50.66
352	Manufacture of other chemical products	0.89	2.63	5.93	18.08	33.36
353	Petroleum refineries	0.04	0.09	0.21	1.60	6.72
354	Manufacture of miscellaneous products of petroleum and coal			9.01	27.90	47.10
355	Manufacture of rubber products	0.32	1.07	2.90	12.65	26.91
356	Manufacture of plastic products not elsewhere classified	0.63	2.03	5.44	25.23	50.88
361	Manufacture of pottery, china and earthenware	2.34	5.31	9.42	26.95	50.41
362	Manufacture of glass and glass products					24.21
369	Manufacture of other non-metallic mineral products					58.54
371	Iron and steel basic industries	0.16	0.46	1.20	7.73	23.18
372	Non-ferrous metal basic industries	0.42	1.40	3.77	17.12	36.82
381	Manufacture of fabricated metal products, except machinery and equipment	1.10	3.69	9.46	34.59	57.75
382	Manufacture of machinery except electrical	1.98	5.73	12.26	33.37	51.05
383	Manufacture of electrical machinery apparatus, appliances and supplies	0.45	1.31	3.07	12.78	28.43
384	Manufacture of transport equipment	0.46	1.32	3.05	12.55	28.25
385	Manufacture of professional and scientific, and measuring and controlling equipment not elsewhere classified, and of photographic and optical goods	0.44	1.12	2.29	7.56	15.98
390	Other Manufacturing Industries	0.78	2.17	4.73	15.34	28.50
3211	Spinning, weaving and finishing textiles	0.61	1.46	2.85	10.00	26.75
3411	Manufacture of pulp, paper and paperboard					8.74
3511	Manufacture of basic industrial chemicals except fertilizers	0.38	0.87	1.83	7.23	15.46
3513	Manufacture of synthetic resins, plastic materials and man-made fibers except glass	0.19	0.43	1.11	5.86	12.90
3522	Manufacture of drugs and medicines	0.33	0.91	2.13	8.93	20.94
3825	Manufacture of office, computing and accounting machinery	0.47	1.29	2.81	9.42	20.31
3832	Manufacture of radio, television and communication equipment and apparatus	0.51	1.34	3.00	11.50	27.45
3841	Ship building and repairing	2.12	4.63	8.01	19.44	36.19
3843	Manufacture of motor vehicles	0.31	0.87	1.91	6.97	17.12
	Average	0.94	2.51	5.43	17.56	33.28