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FINANCE, FIRM SIZE, AND GROWTH

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### **ABSTRACT**

This paper examines whether financial development boosts the growth of small firms more than large firms and hence provides information on the mechanisms through which financial development fosters aggregate economic growth. We define an industry's technological firm size as the firm size implied by industry specific production technologies, including capital intensities and scale economies. Using cross-industry, cross-country data, the results indicate that financial development exerts a disproportionately large effect on the growth of industries that are technologically more dependent on small firms. This suggests that financial development accelerates economic growth by removing growth constraints on small firms and also implies that financial development has sectoral as well as aggregate growth ramifications.

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## I. Introduction

Although a large literature suggests that financial development fosters economic growth, considerably less research examines the cross-firm, cross-industry distributional effects of financial development.<sup>1</sup> Some theories imply that financial development boosts economic growth by disproportionately fostering small firm growth. If smaller, less wealthy firms face tighter credit constraints than large firms face due to greater informational barriers or high fixed costs associated with accessing financial systems, 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).<sup>2</sup> In contrast, other research suggests that most small, less wealthy firms, especially in poor countries, cannot afford financial services, so that financial development disproportionately facilitates the growth of large firms (Greenwood and Jovanovic, 1990).<sup>3</sup>

This paper assesses whether financial development boosts the growth of small firms more than large firms and hence sheds empirical light on (1) debates concerning the distributional implications of financial development, (2) one mechanism through which financial development may affect aggregate economic growth, and (3) a large policy-oriented literature that stresses the importance of small firm growth for economic development. In terms of public policies, the World Bank (1994, 2002, 2004) argues that small firms foster competition, innovation, and employment to a greater degree than large firms and has devoted more than \$10 billion in the last five years toward

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<sup>1</sup> See Levine (2005) for a review of the literature on financial development 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 the level of financial development is positively related to growth and this relationship is not due only to simultaneity bias. Aghion, P., Howitt, and D. Mayer-Foulkes (2005) find that financial development accelerates the speed of convergence toward a steady state, but does not influence steady-state growth.

<sup>2</sup> 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 fixed costs included in loan prices, helping small firms.

<sup>3</sup> Levine and Schmukler (2003, 2004) provide evidence that international financial liberalization has primarily benefited large, rich firms. Also, local banking monopolies may foster close relationships between banks and small firms and

promoting small enterprises. Rather than examining whether small firms per se accelerate growth, we examine whether financial *under*-development exerts a particularly onerous impact on small firms. Furthermore, while considerable research suggests that finance is closely associated with economic growth, dissecting the mechanisms connecting finance and growth provides information on whether – and if so how -- financial development causes growth, or whether financial development is simply associated with fast growing economies. Toward this end, this paper examines whether financial development accelerates growth by boosting small firm growth. Finally, as stressed above, financial development may have distributional implications. This paper examines whether financial development is particularly good for large firms or small firms, or whether financial development has a balanced impact on firms of different sizes.

We examine whether industries that are composed of small firms for technological reasons grow faster in economies with well-developed financial systems. As formulated by Coase (1937), firms should optimally internalize some activities, but size enhances complexity and coordination costs. Thus, an industry’s optimal firm size depends on that industry’s particular production technologies, including capital intensities and scale economies (Kumar, Rajan, and Zingales, 2001). Given estimates of each industry’s technological firm size, 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 technological 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

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thereby 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.

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 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 investment and cash from operations) using data on large, public corporations in the U.S. Assuming that financial markets are relatively frictionless in the U.S., 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 firm size. 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 U.S. Assuming that financial markets are relatively frictionless in the U.S., we therefore identify each industry's "technological" firm size in a relatively frictionless financial system. While conducting a large number of sensitivity checks regarding the validity of this measure of technological firm size, 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 for technological reasons are composed of small firms.

These results are robust to an array of sensitivity checks. Besides confirming that the results hold over different estimation periods, we assess the sensitivity of our findings to using different financial development indicators and alternative measures of small-firm share for each industry. Furthermore, we were concerned that 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 on firm size 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 (2003b) 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 firm size. 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. Finally, we were concerned that market size, human capital skills, and the level of economic development could influence industry size, invalidate the use of the U.S. as the benchmark country, and lead to inappropriate inferences. 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. Moreover, we confirm this paper's findings using the United Kingdom as the benchmark country and when employing alternative definitions of industrial firm size.

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. 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. 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. Beck, Demirguc-Kunt, and Maksimovic (2003), however, find no evidence that financial under-

development distorts firm size. Given this finding, our results imply that financial under-development disproportionately hinders the flow of growth-enhancing financial services to small firms.

Our paper relates closely to two recent papers that examine the importance of financial development for small firms. Using evidence across different region in Italy, Guiso, Sapienza, and Zingales (2004) find that small firms enjoy more growth benefits than large firms from regional financial development.<sup>4</sup> Rather than focusing on inter-regional differences in Italy, we undertake a cross-country, country-industry investigation. Beck, Demirguc-Kunt, and Maksimovic (2005) use firm-level 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 firms.

The remainder of the paper is organized as follows. Section 2 explains the data, while Section 3 describes the methodology. Section 4 presents the main results and sensitivity tests. Section 5 concludes.

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<sup>4</sup> 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 financial development. Similarly, Black and Strahan (2002) show that more competitive banking markets are associated with higher levels of new incorporations in the United States.

## 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. Tables 1 and 2 present descriptive statistics.

### *II.1. Industry growth rates*

$\text{Growth}_{i,k}$  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 firm size. Differences in productive technologies, capital intensities, and scale economies influence an industry's technological firm size (Coase, 1937, and Kumar, Rajan, and Zingales, 2001).<sup>5</sup> To get a proxy measure of each industry's natural firm size, therefore, we need a benchmark economy with relatively few market

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<sup>5</sup> See You (1995) for an overview.

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<sub>k</sub>** 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.<sup>6</sup> 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 firm size and we test for the importance of many potential problems associated with using the United States as the benchmark country for measuring technological firm size.

Given our focus on the relationship between financial development, firm size, and growth, it is logical to use 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 more liquidity constrained than large firms.

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 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 firm size.

As noted, the perfect benchmark country has relatively frictionless markets and 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.

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<sup>6</sup> 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,

Furthermore, we present a battery of sensitivity analyses that assess the validity of using the United States as the benchmark country. We use different measures of Small Firm Share and also use a different benchmark country. 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.

### *II.3. Indicators 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**<sub>*i*</sub> 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

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we need data at the firm level, not the plant level, and we therefore do not resort to Census data prior to 1992.

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.

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:

$$Growth_{i,k} = \sum_j \alpha_j Country_j + \sum_l \beta_l Industry_l + \gamma Share_{i,k} + \delta (Small Firm Share_k * FD_i) + \varepsilon_{i,k}, \quad (1)$$

where  $Growth_{i,k}$  is the average annual growth rate of value added, in industry  $k$  and country  $i$ , over the period 1980 to 90.  $Country$  and  $Industry$  are country and industry dummies, respectively, 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 small firm share 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  $\gamma$ . We include the share in manufacturing rather than the level, since we focus on within-country, within-industry growth rates. 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 firms share, i.e., we focus on the sign and significance of  $\delta$ . If  $\delta$  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  $\delta$  enters 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.

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 (75<sup>th</sup> percentile of Small Firm Share) should grow 1.4% per annum faster than the spinning industry (25<sup>th</sup> percentile of Small Firm Share) in Canada (75<sup>th</sup> percentile of Private Credit) than in India (25<sup>th</sup> percentile of Private Credit).<sup>7</sup> 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 firm size 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 development. Since we also control for cross-industry differences in the technological level of firm size, 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

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<sup>7</sup> We use the results of column 2 in Table 3 for this experiment.

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.<sup>8</sup>

Finally, Table 3 column (3) presents 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.<sup>9</sup>

#### *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.

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<sup>8</sup> 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.

<sup>9</sup> 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 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.

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. If the Small Firm Share is highly (negatively) correlated with External Dependence, the findings on Small Firm Share should vanish when controlling for external dependence. As noted, however, there is not a strong correlation between the Small Firm Share and External Dependence and we find that financial development exerts a particularly pronounced growth-effect on small-firm industries even when controlling for the interaction between financial development and external 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 (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.<sup>10</sup>

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 (2003b) 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. Thus, in Table 4's column 2, we follow Fisman and Love (2003b) 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.

### *IV.3. Sensitivity to Controlling for Different Country Characteristics*

There may also exist 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, columns 3 – 5, 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, and (iii) openness to trade 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

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<sup>10</sup> We also tried an interaction of intangibility and financial development and obtained similar results.

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 firm size. Finally, market size may be associated with financial development, industrial firm size, 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 the interaction between Small Firm Share and a proxy measure of openness to international trade, Openness, which equals exports plus imports divided by 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 Table 4's columns 3 – 5. The interaction of Per Capita GDP and Small Firm Share and the interaction between Openness and Small Firm Share do not enter significantly in columns 3 and 5 respectively. The interaction of Human Capital and Small Firm Share enters positively and significantly at the 10% level, which provides some 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 firm size, and industry growth are robust to controlling for different country characteristics.

#### *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.<sup>11</sup> Table 1 lists Small Firm Share for different 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%.<sup>12</sup> 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 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.

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<sup>11</sup> 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.

<sup>12</sup> 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.

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 (25<sup>th</sup> percentile Private Credit) to Canada (75<sup>th</sup> percentile Private Credit) benefits the industry at the 75<sup>th</sup> percentile of Small Firm Share relatively more than the industry at the 25<sup>th</sup> 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%. This suggests that firm size distribution across industries in the United States is persistent and does not vary significantly over 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.

Critically, we also confirm the robustness of the results when using the United Kingdom as the benchmark economy for computing each industry's technological firm size. We use AMADEUS data for 1997 to calculate the small firm share across industries for the United Kingdom.

AMADEUS is a commercial database maintained by Bureau Van Dijk containing financial statements and employment data for over 5 million firms in Europe, including the United Kingdom. Unfortunately, the data on industrial firm size distribution is not as complete for the United Kingdom as for the United States.<sup>13</sup> Nevertheless, 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 and Private Credit enters positively and significantly at the 5% level (Table 6 column 3), which again confirms this paper's core conclusion.

Finally, the results are robust to controlling for the average 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 control 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. The regressions in columns (4) and (5) of Table 6 show that the interaction of Private Credit with the median firm size of large, listed firms does not enter significantly in any of the regressions at the 5% level. In contrast, we

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<sup>13</sup> Unlike for the U.S. Census, for the U.K. dataset we only have complete data for enterprises above 10 employees so that our U.K. small firm share 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 the United Kingdom 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 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%.

continue to find that the interaction of Private Credit and Small Firm Share enters positively and significantly at the 5% level.

#### *IV.5. 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.<sup>14</sup>

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 by stock markets.<sup>15</sup>

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

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<sup>14</sup> These results also hold when using Commercial-Central Bank from Levine, Loayza and Beck (2000).

<sup>15</sup> These results hold when using stock market capitalization and value traded as alternative stock market indicators.

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 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 firms.

#### ***IV.6. 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. The results imply that one way in which financial development boosts growth is by relieving constraints on the growth of small firms.

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 small firm growth. 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. Employment shares are expressed in percentages of total number of employees.

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

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. **Industry variables:** Small firms 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 (2003b). Industry size 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 firms 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.

Variable	Mean	Median	St.dev.	Minimum	Maximum
<b>Panel A: Country-industry variables</b>					
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
<b>Panel B: Industry variables</b>					
Small firms share (empl<5)	0.011	0.006	0.011	0.001	0.042
Small firms share (empl<10)	0.029	0.018	0.027	0.002	0.112
Small firms share (empl<20)	0.059	0.039	0.053	0.001	0.214
Small firms share (empl<100)	0.184	0.14	0.13	0.013	0.473
Small firms 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
Industry size	2.309	1.225	2.649	0.250	10.60
UK Small firms share	0.010	0.009	0.009	0.000	0.037
<b>Panel C: Country variables</b>					
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

Table 3 Financial development, small firms 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. Private Credit is claims by financial institutions on the private sector divided by GDP in 1980. Small firms 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 regression in column (3) is estimated using legal origin dummies as instrumental variable for Private Credit. 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)	(2)	(3)
	OLS	OLS	IV
Share in value added	-1.012*** (0.253)	-1.095*** (0.253)	-1.086*** (0.253)
Private Credit * Small firm share	0.409** (0.172)	0.445** (0.173)	0.567** (0.220)
Private Credit * External dependence		0.144*** (0.039)	0.101*** (0.037)
Observations	1242	1242	1242
R-squared	0.26	0.28	0.27

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. 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). Per capita GDP is the logarithm of the country's real GDP per capita in 1980. Human capital is average years of schooling in population age over 25 in the year 1980. Openness is the sum of exports and imports relative to GDP in 1980. Small firms 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 (2003b), and is calculated as real annual growth in net sales of U.S. firms over the period 1980 to 1989 using data from 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)
Share in value added	-1.114*** (0.255)	-1.108*** (0.255)	-1.089*** (0.258)	-0.955*** (0.253)	-1.155*** (0.265)
Private Credit * Small firms share	0.356** (0.167)	0.468*** (0.176)	0.485** (0.190)	0.457** (0.186)	0.500*** (0.188)
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)
Property rights * Intangibility	0.008*** (0.003)				
Private Credit * Sales growth		0.774* (0.425)			
Per capita GDP * Small firms share			-0.013 (0.043)	-0.156* (0.081)	-0.012 (0.046)
Human capital * Small firms share				0.071** (0.028)	
Openness*Small Firm share					0.000 (0.002)
Observations	1242	1242	1242	1207	1215
R-squared	0.28	0.28	0.28	0.30	0.27

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. Private Credit is claims by financial institutions on the private sector divided by GDP in 1980. Small firms 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 firms share (empl<5)	2.807*** (0.911)				
Private Credit * Small firms share (empl<10)		1.141*** (0.353)			
Private Credit * Small firms share (empl<20)			0.445** (0.173)		
Private Credit * Small firms share (empl<100)				0.130* (0.072)	
Private Credit * Small firms 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. Private Credit is claims by financial institutions on the private sector divided by GDP in 1980. Small firms 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 1997. UK Small firms 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). Industry size in 1980 is the log of the median number of employees across all U.S. listed firms in Compustat. 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	-1.146*** (0.273)	-1.129*** (0.292)	-1.055*** (0.259)	-1.079*** (0.255)	-1.120*** (0.268)
Private Credit * Small firms share (empl<20) in 1997	0.685*** (0.249)			0.603*** (0.198)	
Private Credit * Small firms share (empl<10) in 1997		1.522*** (0.507)			1.403*** (0.390)
Private Credit * UK Small firms share			1.696** (0.827)		
Private Credit * External financial dependence	0.157*** (0.041)	0.191*** (0.048)	0.153*** (0.042)	0.175*** (0.044)	0.182*** (0.045)
Private Credit * Industry size in 1980				0.020* (0.012)	0.019 (0.013)
Observations	1102	1005	1180	1242	1170
R-squared	0.28	0.29	0.28	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. 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. 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. Small firms 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)
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)
Private credit 1980-89 * Small firms share	0.444*** (0.161)					
Private credit 1980-89 * External financial dependence	0.097***					
Liquid liabilities * Small firms share		0.399** (0.184)				
Liquid liabilities * External financial dependence		0.085*** (0.032)				
Market turnover * Small firms share			0.018 (0.234)			
Market turnover * External financial dependence			0.074** (0.036)			
Legal efficiency * Small firms share				0.053*** (0.020)		
Legal efficiency * External financial dependence				0.009*** (0.003)		
Law and order * Small firms share					0.053*** (0.020)	
Law and order * External financial dependence					0.007*** (0.002)	
Accounting standards * Small firms share						0.363 (0.244)
Accounting standards * External financial dependence						0.158*** (0.034)
Observations	1242	1242	1222	1174	1174	1067
R-squared	0.27	0.27	0.26	0.31	0.31	0.35

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. Private Credit is claims by financial institutions on the private sector divided by GDP in 1980. Small firms 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 firms share (empl<20)	0.249* (0.141)		0.852*** (0.265)
Private Credit * Small firms 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 1 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