THE INFLUENCE OF FINANCIAL AND LEGAL INSTITUTIONS ON FIRM SIZE

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Abstract: Theory does not predict an unambiguous relationship between a country's financial and legal institutions and firm size. Using data on the largest industrial firms for 44 countries, we find that firm size is positively related to financial intermediary development, the efficiency of the legal system and property rights protection. We do not find any evidence that firms are larger in order to internalize the functions of the banking system or to compensate for the general inefficiency of the legal system.

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1. Introduction

A rapidly growing literature, originating with La Porta, Lopez-de-Silanes, Shleifer, and Vishny (1997, henceforth LLSV), has demonstrated the importance of the legal system and financial institutions for firms' financial decisions.[1] For the most part, this literature treats firm size as given. However, financial intermediaries and the legal system provide an alternative way of accomplishing some of the key functions that the firm accomplishes internally: the mobilization of resources for investment, the monitoring of performance, and resolution of conflicts among different parties. As a result, the optimal size of firms might also depend on the development of these institutions in each country. In this paper, we investigate empirically the relationship between firm size and financial and institutional development across countries.

The corporate finance literature suggests that financial and legal institutions could affect firm size in opposing ways. In countries with underdeveloped financial and legal systems, large firms' internal capital markets are likely to be more effective at allocating capital and monitoring individual investment projects than the public markets and financial institutions. Along these lines, Almeida and Wolfenzon (2003) provide a theoretical model of the relationship between the scope of firms and the level of investor protection in an economy and the allocative efficiency of public capital markets. Given the differences in relative efficiency, firms in countries with weak legal and financial systems may have an incentive to substitute internal capital markets for public markets. This substitution would suggest an inverse relationship between firm size and the development of a country's legal and financial institutions.

There may also be another opposing effect at work. Large firms are also subject to agency problems. Their size and complexity makes expropriation by firms' insiders difficult to monitor and

[1] See LLSV (2000), Bekaert and Harvey (2003), and Beck and Levine (2005) for an overview of this literature.

control by outside investors. Thus, investors in large firms may require strong financial institutions and effective legal systems to control expropriation by corporate insiders. These considerations suggest that the optimal size of firms may be positively related to the quality of a country's financial and legal system. Thus, the relationship between firm size and institutional development is likely to depend on the relative importance of these two effects.

To test which of these opposing effects is dominant, we need to focus on a sample of firms that are able to choose their boundaries and determine their size without significant constraints. However, several papers in the literature suggest that in countries with less developed legal and financial systems, firms are constrained in their operation and growth by their ability to obtain external finance (Demirguc-Kunt and Maksimovic, 1998; Rajan and Zingales, 1998; Beck, Demirguc-Kunt and Maksimovic, 2005). If firms are constrained in their ability to grow and reach their optimal size due to access issues, the above trade-offs would be blurred. For example, even if underdeveloped institutions make it optimal for a firm to substitute internal markets for public markets and thus become large, financing constraints may prevent it from growing to its optimal size. Recent research, however, has shown that there are differences across firms of different sizes in the extent to which they are growth-constrained. Schiffer and Weder (2001), Beck, Demirguc-Kunt and Maksimovic (2005) and Beck, Demirguc-Kunt, Laeven and Maksimovic (2006) show that larger firms not only report lower growth constraints, but that the effect of different obstacles is less growth constraining for large than for small firms. Thus, in this paper we focus on the largest listed firms across countries to minimize confounding our estimates of size with growth constraints.

We investigate empirically the relationship between firm size and the development of financial and legal institutions in 44 countries, using information from financial statements on up to 100 largest listed industrial firms in each country. We use sales in constant US dollars, averaged over the period

1988-2002, as our main indicator of firm size, with total assets and market capitalization as alternative size indicators. We include an array of firm-, industry- and country-level variables in our analysis to control for other factors that determine equilibrium firm size, such as technology, market size, human capital and economic development.

We find that there exists a positive relationship between the development of a country's financial system and firm size, even after controlling for the size of the economy, income per capita and several firm and industry characteristics. Development of financial institutions and higher capitalization of stock markets are associated with larger firm size. This finding is robust to controlling for other country characteristics, reverse causation and the variation in sample size across countries, as well as to utilizing alternative size indicators and sample periods. While we also find a positive association of more efficient legal systems and of better property right protection with firm size, these results are less robust to the different sensitivity tests.

While we show the robustness of our results to numerous sensitivity analyses, our findings are subject to several caveats. First, our data do not allow us to control for cross-country differences in accounting norms and we have limited information on the prevalence of business groups. Second, while we control for an array of firm-, industry- and country-level variables, we cannot explicitly control for the production technology of each firm and the input and product market conditions it faces. In spite of these important data restrictions, however, we interpret the strong positive relationship between financial development and firm size as empirical evidence that the financial system helps reduce agency problems within the firm.

Our paper is related to the newly emerging literature on the impact of financial and legal institutions on firm performance. LLSV (1997, 1998), Demirguc-Kunt and Maksimovic (1998), and Rajan and Zingales (1998) show that developed financial systems and the efficient enforcement of

laws facilitate external funding of firms. These papers take the distribution of firm size as exogenous. By contrast, we allow for the possibility that firm organization may adjust in response to the level of development of institutions and show that firm size increases with both the development of the financial sector and more efficient enforcement of laws.

Our paper is also related to two recent papers by Kumar, Rajan and Zingales (1999) and Cetorelli (2002). While Kumar, Rajan and Zingales also examine the determinants of firm size across countries, their approach statistically infers firm sizes in different countries from aggregate industry data in each country.[2] By contrast, we obtain our data from financial reports for individual firms. Further, their sample is restricted to EU countries, while we have a broad sample of both developed and developing countries. Finally, while Kumar et al. focus on the efficiency of judicial systems, we assess the effect of financial and legal institutions. Cetorelli (2002) uses industry-level data for 17 OECD countries to assess the effect of bank concentration on industrial concentration. He, however, uses the average firm size for an industry rather than firm-level data, as we do. He finds a positive effect of bank concentration on firm size. Unlike our paper, he also focuses on a specific banking market structure variable – bank concentration – rather than broader indicators of financial and legal development.

The remainder of the paper is organized as follows. In Section 2 we discuss the hypotheses that we test. Section 3 discusses the data and our empirical methodology. Section 4 presents our main results and section 5 concludes.

[2] Specifically, they have the number of firms per size bin available across 55 industries and 15 countries, where bins are defined according to ranges of the number of employees.

2. Motivation

The key question in analyzing institutional determinants of firm size was posed by Coase (1937): "Why does the boundary of the firm and the market fall where it does?" Coase argued that certain productive tasks are optimally done within firms, where actions of subordinate managers can be optimally monitored, but that with increasing size firms become inefficient. As a firm grows, there comes a point where it reaches optimal size where the marginal intra-firm and market transaction costs are equal. The optimal size for each firm depends on its organizational capital, or in the case of entrepreneurial firms, on the abilities of the entrepreneur (Lucas, 1978; Maksimovic and Phillips, 2002; Almeida and Wolfenzon, 2003). However, little is known about how the functioning of financial institutions and legal systems in a country affects the balance between intra-firm and market transaction costs and thus how the optimal firm size varies across countries. We next discuss how such an impact could arise.

2.1. Internal monitoring, access to capital, and firm size

Through its impact on market and intra-firm transaction costs, the state of a country's financial and legal institutions can determine whether it is more efficient to organize an activity as a small stand-alone firm, or as a unit of a larger firm.[3] A firm's internal capital allocation process may function more efficiently than a public capital market. Firms are hierarchies, and senior managers can command managers in charge of a project to produce information, and provide finely calibrated incentive schemes. In the event it becomes necessary, the firm's senior management can seize direct control of a non-performing unit and liquidate its assets. These advantages of internal allocation of resources are particularly valuable in economies without effective external monitoring by financial intermediaries or

a legal system that can safeguard creditors' claims on assets.[4] If this conjecture is valid and the effect material, we would expect that, *holding other variables constant, the optimal firm size is larger in countries with inefficient legal systems and underdeveloped financial systems.* The effect of financial and legal development would thus be larger on market than on intra-firm transaction costs.

However, advantages to size might be offset if insiders of large firms can expropriate more investor wealth in countries with weak institutions. In this case, the low quality of external monitoring or the inability of external investors to prevent misappropriation acts as a cost to size. A firm in a country with significant agency costs of size may mitigate those costs by, for example, remaining under family control, perhaps at the cost of reduced ability to fund large positive net present value investments. If external monitoring is more important in reducing dissipation in larger firms, then holding other variables constant, *the optimal firm size is smaller in countries with inefficient legal systems and underdeveloped financial systems.* According to this conjecture, the effect of financial and legal development is larger on intra-firm than on market transaction costs. Below, we empirically examine the relationship between firm size and development of financial and legal systems to see which effect is greater in magnitude.

There is little empirical evidence on how firm size affects the relationship between the quality of a country's financial institutions and the ability of managers to expropriate wealth. However, evidence on a related question, whether in multi-divisional firms, which are organized so that managers have discretion to shift funds across divisions, are subject to greater agency costs than single-division firms, suggests that there might exist a similar relationship between weak external monitoring that permits managerial discretion and value dissipation. Early studies using U.S. data by

[3] See Stein (2002) and Almeida and Wolfenzon (2003) for an analysis of the role of information flows in the organization of firms.

[4] As Fluck and Lynch (1999) points out, some projects that may be subject to agency costs if financed on a stand-alone basis, particularly when renegotiation is costly, become viable as part of a larger corporation.

Lang and Stulz (1994), Berger and Ofek (1995) and Comment and Jarrell (1995) argue that when managers can allocate funds across industries in multi-divisional firms, the value of the firm declines relative to a single-segment firm benchmark. Using a Census data set that contains smaller single-segment firms, however, Villalonga (2004) argues that there may be rather a conglomerate premium. The few available cross-country studies also do not present a unified picture. Lins and Servaes (2002) find widespread evidence of a conglomerate discount, whereas Fauver, Houston and Naranjo (2002) find evidence of conglomerate discounts in financially well developed economies, but conglomerate premia in countries with less developed financial systems. There is also contradictory evidence on the efficiency of internal capital markets. Shin and Stulz (1998), Rajan, Servaes and Zingales (2000), Scharfstein and Stein (2000) argue that firms allocate capital across industries inefficiently, whereas Whited (2001) and Maksimovic and Phillips (2002) do not find evidence of inefficiency.

2.2. Focus on large firms

Even if optimal firm size is larger in countries with underdeveloped legal and financial institutions, firms in developing countries may face financing obstacles that prevent them from reaching their optimal size (Demirguc-Kunt and Maksimovic, 1998). These obstacles are higher for small firms than for large firms and the disparity is larger in countries with poor institutions (Beck, Demirguc-Kunt and Maksimovic, 2005; Beck, Demirguc-Kunt, Laeven and Maksimovic, 2006). Further, the effect of growth obstacles on actual growth is significantly larger for small firms than for large firms (Beck, Demirguc-Kunt and Maksimovic, 2005). Thus, these growth obstacles have the potential of confounding estimates of the relationship between desired firm size and a country's institutions. To minimize such confounding we focus on the largest firms in each country.[5] These

[5] This is similar to the approach in the La Porta et al. (1999) study on ownership concentration or the studies by Demirguc-Kunt and Maksimovic (1998, 1999) on capital structure.

firms are likely to be the least constrained in their economies, not only financially, but – as shown by Schiffer and Weder (2001) - also along other dimensions of the business environment and thus the firms most likely to be able to choose their optimal size. Thus, investigating the size decisions of largest firms should provide a clearer test of the underlying trade-offs than a test based on average firm size.

2.3. Other determinants of firm size

While in this paper we are mainly interested in transaction cost, or institutional determinants of firm size (Coase, 1937; Williamson, 1985), optimal firm size can also depend on a firm's production technology and the input and product market it faces.[6] We include additional firm, industry and country level variables proxies for alternative theories of firm size when exploring the relationship between firm size and financial and legal institutions.

The conventional microeconomic approach, also known as the technological approach, argues that firm size is determined by technical and allocational efficiency (Baumol et al., 1982; Panzar, 1989). Following this literature, we expect capital intensity to be positively related to size. A contrasting view to both institutional and technological theories is that firm size is determined by its market power rather than by efficiency (Kitching, 1982). Firm profitability, size of markets, as well as openness of economies are variables that can impact and capture firms' actual and potential market power. Profits, however, can reflect greater efficiency as well as market power.

Theory also predicts a relationship between firm size and economic development and the level and distribution of human capital. Richer economies should have larger firms, since potential

[6] There are also stochastic theories of firm size which argue that the growth rate of a firm and its future size is independent of its current size and its past growth history (Gibrat's Law). However, the observed empirical relationship between firm size and growth, as well as the lack of explanation of the law for new entry and growth-age relationships indicate its limits. See You (1995) for a discussion of this and other theories of firm size.

entrepreneurs face higher opportunity costs in the form of higher wages (Lucas, 1978). A higher level of human capital in an economy might either enable larger firms, due to higher managerial skills, or lead to more entry and thus smaller firms, due to more wide-spread entrepreneurial skills (Lucas, 1978; Rosen, 1982; Kremer, 1993). Controlling for these factors will reduce the risk that the institutional and legal variables we use are proxying for other factors that depend on a country's level of development.

3. Data and methodology

We have data, for the period 1988-2002, available for 44 countries, both developing and developed. To make the sample of firms comparable across countries, we focus on the top 100 listed manufacturing companies, where available, with a total of 3,339 firms in our sample.[7] This section describes the data and its sources, discusses the descriptive statistics and explains the methodology that we employ.[8] Table 1 lists the economic and institutional indicators for the 44 countries in our sample, averaged over the sample period 1988-2002, where available. Table 2 provides descriptive statistics and correlations of all the variables, including the firm-specific characteristics that we use as control variables in our firm-size regressions reported below.

3.1. Indicators of firm size

The firm-level data are drawn from financial statements of large publicly traded firms, collected by Worldscope. We use the total sales of a firm in constant U.S. dollars as our main dependent variable. Figure 1 shows that there is a wide variation in firm size across countries, ranging from $19 million in Peru to $17.5 billion in the U.S. However, there is also a wide variation in firm size within countries. While the cross-country standard deviation of firm size as measured by sales is

$8.2 billion, the within-country standard deviation is $7.2 billion. Figure 2 shows the average firm size for the largest, 2nd largest, 3rd largest etc. firm across all countries. While the largest listed firm across countries has, on average, sales of $22.8 billion, the 100th largest firm has, on average, sales of only $510 million.[9]

While these data are the best available for purposes of cross-country comparison, they raise several issues. First, in some countries the largest firms might not be included in Worldscope because they are not listed and therefore not obliged to submit financial information to the public. Second, our data do not allow us to ascertain that all large firms in a country are independent from each other; some of them might belong to business groups and thus be related to each other through ownership links. However, assuming that there is negative correlation between the prevalence of business groups and financial and legal development, mis-measurement due to the existence of business groups would bias our results against finding a positive relationship between firm size and the efficiency of financial and legal institutions. Further, in our sensitivity analysis, we will show the robustness of our findings to proxies for the prevalence of business groups both on the firm- and country-level for a sub-sample of firms. Third, our data might be subject to mis-measurement due to exchange rate distortions and due to different accounting norms. To control for exchange rate distortions, in robustness tests, we use sales in local currency units multiplied with the Purchasing Power Parity exchange rates from World Development Indicators. Since we do not have information on accounting norms beyond general measures of the quality of accounting standards, we examine the robustness of our findings using two alternative indicators of firm size: total assets in constant U.S. dollars and market capitalization in constant U.S. dollars. While total assets are also derived from firms' financial statements, market

[7] See Appendix Table A1 – available on request - for number of firms in each countries and number of observations. For 21 countries, we have less than 100 listed firms.
[8] For a detailed description of the data and their sources, see Appendix Table A3, available on request.

capitalization does not depend on accounting norms and standards. While the correlation between total assets and total sales in constant US dollars is 96%, the correlation of sales with market capitalization is 68%.

3.2. Indicators of financial and institutional development

We use an array of cross-country indicators from the literature to assess the relationship between financial and institutional development and firm size. We focus on Private Credit, the claims of deposit money banks and other financial institutions on the private sector as share of GDP, as our main indicator of financial development (Beck, Demirguc-Kunt and Levine, 2000). Private Credit constitutes only 15% of GDP in Peru, but 159% in Switzerland. Our main indicator of legal system efficiency is Contract Enforcement, the time estimate in calendar days of the process of dispute resolution (Djankov et al., 2003). Our sample varies from countries with very speedy judicial processes, such as the Netherlands (39 days) and countries with very slow processes, such as Poland (1,000 days). Finally, we use a broad measure of institutional development; Property Rights captures the degree of legal protection of private property and the probability that the government will expropriate private property. The index ranges from one (China) to four (U.S. and many other OECD countries), with higher values indicating better protection of property rights.

In robustness tests, we use Stock Market Capitalization, the value of outstanding shares as share of GDP, to measure the level of stock market development. Judicial Efficiency is a survey-based indicator of the efficiency and integrity of the legal system as it affects businesses, ranging from zero to ten, with higher values indicating more efficiency. The Legal Formalism index captures the extent of substantive and procedural statutory intervention in the legal system, ranging from zero to seven,

[9] Note that we have fewer countries for the 100th largest firm since many countries have data for less than 100 firms available in Worldscope.

with higher values indicating more formalistic legal systems (Djankov et al., 2003). Finally, Control of Corruption is a measure of lack of corruption in government, on a scale of zero to six. Lower scores indicate that high government officials are more likely to demand special and illegal payments.

3.3. Firm-, industry-, and country-level control variables

We employ several firm-, industry- and country-level variables to control for firms' production technologies, the input and product market they are facing and other factors that might confound the empirical relationship between firm size and financial and legal institutions.

We use three firm-specific characteristics as control variables. First, we use Net Fixed Assets divided by Total Assets to explore whether the structure of a firm's assets can explain its size. A firm with a larger share of fixed assets in total assets has more collateral, thus larger borrowing power and should therefore be better able to expand its operation using external finance. Second, we use Net Sales to Net Fixed Assets to capture capital intensity and to control for different financing patterns across firms. Specifically, firms with higher net sales relative to fixed assets might need more short-term financing to support sales. Finally, we use Return on Assets to explore whether more profitable firms are also larger.

To control for industry differences in firm size, we introduce 19 industry dummies in our baseline regression that control for the main 2-digit SIC industry in which the firm is active.[10] In unreported robustness tests, we also use four industry characteristics. Specifically, we use External Dependence from Rajan and Zingales (1998), Intangible Intensity from Claessens and Laeven (2003) and labor and R&D intensity.

[10] Appendix Table A2 lists the industries. Unfortunately, we do not have data available on other industries in which the firm is active.

We also use a broad array of country-level indicators to control for influences predicted by different theories of firm size. The level of Gross Domestic Product (GDP) measures the overall size of the economy, and GDP per capita indicates the income level of countries; both are measured in constant U.S. dollars. The latter can capture economy-wide capital intensity (Banerji, 1978) but also the lower incentives of entrepreneurially oriented employees to found their own firms given the higher wages in economically more developed economies (Lucas, 1978). We use the inflation rate to indicate macroeconomic volatility and uncertainty. The share of trade in GDP – the sum of exports and imports divided by GDP – indicates the degree of openness of economies and can affect firms' market power, while the rate of gross enrollment in secondary education proxies for the level of human capital accumulation in the economy, enabling larger firms, but also more new entry. In unreported correlations, available on request, we find that firms are significantly larger in larger and richer countries with higher secondary school enrollment rates, lower inflation rates and lower trade shares.

3.4. Methodology

To explore institutional determinants of firm size we use a cross-section of firm-level data, averaged over the sample period and including industry dummies. Our cross-sectional regressions take the following form:

$$SIZE_{i,j} = \beta_1 FIRM_i + \beta_2 MACRO_j + \beta_3 INST_j + \zeta_k + \varepsilon_{i,j} \qquad (1)$$

where SIZE of firm i in country j is measured by total sales in constant U.S. dollars, FIRM is a set of firm characteristics, MACRO is an array of country-level variables, and INST is a vector of financial, legal and institutional development indicators. Finally, we control for 20 industries by including industry dummies, captured in the vector ζ.[11] While our sample includes over 3,300 firms, omitted

[11] See Appendix Table A2 for the list of industries.

country-level characteristics might cause correlation of $\varepsilon_{i,j}$ within countries. To control for this, we allow for clustering within countries. Specifically, we require that error terms are independent across countries but not necessarily within countries.

4. The results

The results reported in column (1) of Table 3 suggest that firms are larger in countries with better developed financial intermediaries. Private Credit enters with a significant and positive coefficient. The relationship between financial institutions and firm size is not only statistically significant but also economically relevant. Take the example of Turkey. The regression result in column (1) suggests that, controlling for firm, industry and country characteristics, if Turkey (Private Credit = 0.16) had the same level of financial intermediary development as Korea (Private Credit = 1.03), the average firm size of the largest firms in Turkey would have been $ 630 million dollars instead of $250 million, or more than double the size.[12]

The result in column (2) suggests that countries with more effective judicial systems, as measured by the speed of dispute resolution, have larger firms. Contract Enforcement enters negatively and significantly at the 5% level. The economic effect again is large. Consider the example of Italy, where it takes 645 days to enforce a claim through the courts, compared with Japan, where it takes 60 days. If Italy had the same speed of dispute resolution as Japan, regression (2) suggests that its largest firms would have an average size of $4.1 billion instead of the actual $2.3 billion.

[12] This is derived by adding the product of the difference in Private Credit and the coefficient in column 1 to the log of average firm size in Turkey and taking the anti-log of the result. Note this is only an illustrative example. Such conceptual experiments do not explain how to improve financial development and the changes discussed above are not marginal. It rather illustrates that firms in countries with higher levels of Private Credit choose wider boundaries of the firm, subject to their production technologies and the input and product markets they face.

The results in column (3) suggest that firms are larger in countries with better property right protection. Property Rights enter positively and significantly at the 5% level. As in the case of Private Credit and Contract Enforcement, the economic effect is large. Consider Colombia (Property Rights = 1.88) and Canada (Property Rights = 4); regression 3 suggests that Colombia's largest firms would have average sales of $495 million instead of the actual $221 million if Colombia had Canada's level of property right protection.

To save degrees of freedom at the country level we include only two macroeconomic variables, GDP and GDP per capita, in the baseline regressions.[13] We see that firms are significantly larger in larger economies, consistent with the correlations reported in Table 2. While we also find a positive relationship between GDP per capita and firm size, this is not robustly significant across all specifications. Turning to firm level controls, there is a negative relationship between the ratio of sales to net fixed assets (NSNFA) and firm size. This result coupled with the positive coefficient on GDP per capita suggest that higher capital intensity both at the firm and country level lead to larger firms. We find a positive and significant relationship between firm size and the ratio of net fixed assets to total assets, suggesting that firms with higher needs for machinery and equipment are larger. Finally, we see a positive but insignificant relationship between return on assets and firm size. Although not reported in the table, the industry dummies enter jointly significantly at the 1% level. Firms in the tobacco and petroleum industries are disproportionally large, while firms in the apparel and furniture industry are, on average, smaller. Firm-, industry- and country-level variables together explain around 50% of the variation in firm size across countries. While this is high for firm-level

[13] Since both variables are highly correlated with financial development and contract enforcement, we confirm our results excluding these two variables. Results are available on request.

regressions, it suggests that there are other firm-, industry- and country-level characteristics associated with firm size that we do not capture in our regressions.

Table 4 suggests that the positive relationship between financial intermediary development and firm size is robust to controlling for other country characteristics, such as macroeconomic stability, educational attainment and openness to international trade, while the relationship between legal system efficiency, property right protection and firm size is not. When controlling for other country characteristics, Private Credit continues to enter significantly at the 1%-level, while both Contract Enforcement and Property Rights enter insignificantly. We also find that macroeconomic stability, educational attainment and openness to international trade are not significantly related to firm size.[14] Overall, this suggests that while financial intermediary development is robustly linked with firm size and is not proxying for other country characteristics, the link between property rights and firm size and especially between contract enforcement and firm size is more sensitive to controlling for other country traits.[15]

The results in Table 5 suggest that the relationship between Private Credit, Contract Enforcement, Property Rights and firm size is not due to reverse causation. A concern with our finding might be that a certain firm size distribution might drive the development of financial and legal institutions. We therefore use the legal origin and geographic location as instrumental variables for Private Credit, Contract Enforcement and Property Rights. Cross-

[14] Since the different country-level characteristics are highly correlated with each other, we test the robustness of our findings to including only one of the three additional variables at a time. Our main findings of a positive relationship between financial intermediary development and firm size are confirmed, while the relationship between contract enforcement and firm size is significant when only controlling for education or inflation. The relationship between property right protection and firm size is significant at the 5% level, when we include only one additional control variable at a time. The findings on the three control variables are confirmed. Results are available on request.

country research has shown the importance of legal tradition and initial endowments for financial, legal and institutional development (Beck, Demirguc-Kunt and Levine, 2003; Beck and Levine, 2005). The results in Table 5 show that the exogenous components of Private Credit and Property Rights are positively related to firm size at the 1%-significance level, while the exogenous component of Contract Enforcement enters negatively and significantly at the 10% level.[16]

The Table 6 regressions show the robustness of our findings to alternative indicators of financial and institutional development. Specifically, the results indicate that the size of a country's stock market and the flexibility of the judicial system are positively and significantly related to firm size. Stock Market Capitalization enters positively and significantly at the 1%-level, suggesting that countries with larger stock markets have larger firms. The results also suggest that firms are larger in countries with less statutory intervention in the judicial process. A third alternative indicator, Judicial Efficiency, enters positively and significantly at the 12% level. Finally, we do not find any evidence that firms are larger in countries with lower levels of corruption, which is due to the high correlation of GDP per capita with Control of Corruption.[17] This suggests that stock market development and the efficiency and flexibility of the legal system are associated with larger firm size, while it is harder to distinguish the effect of other elements of the institutional framework such as the degree of corruption due to their high correlation with GDP per capita.

[15] Note that the insignificant coefficient on Contract Enforcement is not due to the smaller sample (we lose Singapore and Taiwan when controlling for both education and openness), as it enters significantly at the 5% level when we exclude these two countries from the regression in Table 3.
[16] We note that the regression coefficients are significantly higher than in the OLS regressions, which points either to measurement problems or to a negative reverse causality, i.e. larger firms depressing financial and institutional development, which biases the OLS coefficients downwards. Compare discussion in Kraay and Kaufman (2002).
[17] Control of Corruption enters positively and significantly if we drop GDP per capita from the regression.

Table 7 suggests that our findings are robust to the different number of observations across countries. While we aimed to have the 100 largest firms for each country in our analysis, many countries have less than 100 firms listed and reported in Worldscope. Since our variables of interest are on the country-level, this might bias the results. We run two robustness tests to minimize the impact of this data shortcoming. Panel A present results where we limit the sample to the largest 25 firms for each country, while the Panel B regressions are weighted by the inverse of the number of observations for each country to thus take into account the varying number of firms across countries. [18] In both cases, our findings are confirmed. In Panel A, Private Credit and Contract Enforcement enter both significantly at the 1% level, while Property Rights does not enter significantly. In Panel B, Private Credit enters positively and significantly at the 1% level, Property Rights positively and significantly at the 10% level, while Contract Enforcement enters negatively, but insignificantly.

The results in Table 8 show that our findings are not sensitive to exchange rate distortions and to the sample period. Using the official or market-based exchange rate to compare firm size across countries might lead to distortions if the exchange rates are not market based. Panel A therefore shows the robustness of our results to using firm size in local currency and adjusted by the Power Parity Purchasing conversion rates rather than the market exchange rates.[19] Both Private Credit and Property Rights enter positively and significantly at the 5% level, while Contract Enforcement does not enter significantly. The Panel B regressions show that our findings are robust to the sample period. Specifically, calculating firm size over a 14 year period might confound growth with size effects. We therefore recomputed all time-

[18] We have data on 25 firms for 40 out of the 44 countries in our sample.
[19] The Purchasing Power Parity conversion factor is defined as the number of units of a country's currency required to buy the same amount of goods and services in the domestic market as one U.S. dollar would buy in the U.S.

varying variables over the period 1998-2002 and confirm our results. Private Credit enters positively and significantly at the 1% level, Property Rights positively and significantly at the 5% level, while Contract Enforcement enters negatively and significantly at the 10% level.

The results in Table 9 show that the relationship between firm size and financial intermediary development is robust to using alternative size indicators, while the positive relationship between legal system efficiency, property right protection and firm size is more tenuous.. Specifically, we use total assets of the firm in constant US dollars and market capitalization in constant US dollars as dependent variables. In both cases, Private Credit enters positively and significantly at the 5% level, while Contract Enforcement and Property Rights enter insignificantly.

Table 10 shows that our findings are not driven by the existence of outliers. Given the skewed nature of our data, outliers might drive our results. In Panel A, we therefore utilize a robust estimation technique that uses all observations, but assigns different weights based on the absolute value of their residuals to thus avoid the impact of outliers. Private Credit, Contract Enforcement and Property Rights enter significantly at the 1% level. Next, Panel B controls for industry composition by using an industry-adjusted measure of firm size. Specifically, we calculate the difference between firm sales and the average sales across all firms and all countries for the respective industry.[20] While Private Credit enters positively and significantly at the 1% level, Contract Enforcement and Property Rights enter significantly at the 5% level.

Table 11 shows that our results are robust to controlling for the prevalence of business groups. While Worldscope does not offer information on whether a firm belongs to a business

[20] Specifically, we take the difference between the log of sales in million of US$ and the log of the average firm size in each industry in billions of constant US$.

group, we use ownership concentration as proxy variable, assuming that firms where the dominating shareholder holds more than a certain percentage of equity are more likely to be part of a business group. Unfortunately, this reduces the sample to 2,654 firms. Specifically, we test whether the relationship between firm size and financial and legal institutions is confirmed once we control for a dummy variable indicating that the dominating shareholder holds at least 40%, 50% or 60% of equity in a firm. The results in Panel A-C in Table 11 show that firms in countries with higher Private Credit and faster Contract Enforcement are larger, while firms with higher ownership concentration – firms thus more likely to belong to business groups – are smaller. The relationship between firm size and Property Rights turns insignificant, which is due to the smaller sample, as is shown in Panel D where we repeat our baseline regressions from Table 3 with the smaller sample of firms for which we have information on ownership concentration.[21] While certainly imperfect proxies these results suggest that our findings are not driven by the prevalence of business groups across many developing countries.

In unreported regressions, available on request, we also show the robustness of our results to replacing the industry dummies with specific industry characteristics. Specifically, we control for the dependence on external finance, reliance on intangible assets, labor intensity and R&D intensity. Only labor intensity enters significantly in the regressions, with a negative sign. Size and sign of our financial and institutional variables are not affected,

[21] In unreported regressions, we also find negative interaction terms between Private Credit and the dummy variables for ownership concentration and Property Rights and ownership concentration, suggesting that the importance of financial and legal institutions is diminished for firms belonging to business groups. Finally, we also use a country-level proxy for ownership concentration – the ownership owned by the three largest shareholders in the ten largest non-financial, privately-owned domestic firms across countries – as constructed by La Porta et al. (1999). While the relationship between firm size and Private Credit is confirmed, the coefficients on Contract Enforcement and Property Rights turn insignificant.

5. Conclusion

In this paper we examine the relationship between the development of a country's financial and legal institutions and the size of the largest firms in the country. Our empirical results indicate that firms are larger in countries with more developed financial systems. Firm size increases with financial institution and stock market development. These effects persist even when we control for a large number of firm, industry and country characteristics and perform an array of other robustness tests. The relationship between legal system efficiency and firm size is more tenuous. While Contract Enforcement and Property Rights are related to firm size, the relationship is not robust across all specifications.

Overall, our results do not support the view that large firms with internal markets and hierarchies can compensate for the underdevelopment of financial and legal institutions in a country. Rather, well-developed institutions are a pre-requisite for the development of large corporations.

While we have focused on the largest firms across countries in our empirical work, our findings might have important ramifications for policies aimed at small and medium-sized enterprises. While our empirical findings are based on a sample of large listed firms, firms of all sizes face the trade-off between intra-firm transaction and market transaction costs. If financial and institutional underdevelopment makes firms choose a smaller size, firms will similarly prefer to stay smaller than in countries with well developed financial and legal institutions. Thus, programs aimed at encouraging smaller firms to expand to a larger size might fail in the absence of well developed financial and legal institutions.

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Table 1
Economic and Institutional Indicators

GDP/CAP is real GDP per capita in 2000 US $; PRIVATE CREDIT is the ratio of private credit by deposit money banks and other financial institutions to GDP; STOCK MARKET CAPITALIZATION is the value of listed shares (stock market capitalization) to GDP; LEGAL FORMALISM, scored 1 to 7 is an index of the degree of statutory intervention in commercial dispute resolution; PROPERTY RIGHTS, scored 1 to 5, is an index of private property rights; CONTROL OF CORRUPTION, scored 0 to 6, is an indicator of the lack of corruption; CONTRACT ENFORCEMENT is an indicator of contract efficiency measured by the average number of calendar days for the resolution of a commercial dispute; JUDICIAL EFFICIENCY, scored 0 to 10, is a measure of the integrity and efficiency of the legal environment as it affects the business environment. Values are 1988-2002 averages, except for Legal Formalism (2000), Contract Enforcement (2000), and Judicial Efficiency (1980-1983).

	GDP/CAP	PRIVATE CREDIT	STOCK MARKET CAP	LEGAL FORMALISM	PROP. RIGHTS	CONTROL OF CORRUPTION	CONTRACT ENFORCEMENT	JUDICIAL EFFICIENCY
Argentina	7,068.05	0.18	0.23	5.40	2.75	3.09	300.00	6.00
Australia	18,105.37	0.69	0.68	1.80	4.00	4.96	319.50	10.00
Austria	21,258.27	0.94	0.13	3.52	4.00	4.73	434.00	9.50
Belgium	19,938.93	0.62	0.50	2.73	4.00	4.31	365.00	9.50
Brazil	3,338.66	0.31	0.22	3.06	2.00	3.32	380.00	5.75
Canada	20,518.70	0.92	0.71	2.09	4.00	5.89	421.00	9.25
Chile	4,130.62	0.57	0.72	4.57	4.00	3.46	200.00	7.25
China	614.11	0.93	0.21	3.41	1.00	2.94	180.00	
Colombia	1,962.11	0.26	0.12	4.11	1.88	2.54	527.00	7.25
Czech Republic	5,110.21	0.57	0.21	4.06	3.00	4.14	270.00	
Denmark	26,742.89	0.56	0.41	2.55	4.00	5.93	83.00	10.00
Finland	20,236.80	0.68	0.77	3.14	4.00	6.00	240.00	10.00
France	20,246.21	0.88	0.50	3.23	3.00	4.44	210.00	8.00
Germany	20,901.92	1.03	0.34	3.51	4.00	5.10	154.00	9.00
Greece	9,335.36	0.38	0.35	3.99	2.88	4.81	315.00	7.00
Hong Kong, China	21,810.92	1.50	2.21	0.73	4.00	4.33	180.00	10.00
Hungary	4,118.29	0.31	0.16	3.42	3.00	4.59	365.00	
India	376.24	0.24	0.25	3.34	2.00	2.63	106.00	8.00
Indonesia	746.27	0.38	0.17	3.90	1.75	1.71	225.00	2.50
Ireland	18,004.46	0.76	0.59	2.63	4.00	4.11	183.00	8.75
Israel	16,305.22	0.65	0.38	3.30	3.00	4.27	315.00	10.00
Italy	17,175.81	0.60	0.29	4.04	3.00	3.46	645.00	6.75
Japan	35,138.39	1.54	0.81	2.98	3.88	4.22	60.00	10.00
Korea, Rep.	8,807.68	1.03	0.39	3.37	4.00	3.56	75.00	6.00
Malaysia	3,246.68	1.11	1.61	2.34	2.75	3.66	270.00	9.00
Mexico	5,284.58	0.20	0.26	4.71	2.13	2.81	325.00	6.00
Netherlands	20,437.46	1.39	0.90	3.07	4.00	5.92	39.00	
New Zealand	12,442.51	0.89	0.45	1.58	4.00	5.61	50.00	10.00
Norway	32,322.50	0.86	0.28	2.95	4.00	5.57	87.00	10.00
Pakistan	499.55	0.24	0.14	3.76	1.88	2.12	365.00	5.00
Peru	1,907.00	0.15	0.17	5.60	2.00	2.98	441.00	6.75
Philippines	933.47	0.35	0.49	5.00	3.00	2.58	164.00	4.75
Poland	3,610.44	0.18	0.08	4.15	2.88	4.29	1,000.00	
Portugal	9,058.80	0.80	0.29	3.93	3.00	4.81	420.00	5.50
Singapore	18,287.95	1.03	1.38	2.50	4.00	4.11	50.00	10.00
South Africa	3,037.63	0.58	1.50	1.68	2.00	4.34	207.00	6.00
Spain	12,206.38	0.82	0.43	5.25	3.00	4.23	147.00	6.25
Sweden	24,012.00	1.06	0.78	2.98	3.25	5.96	190.00	10.00
Switzerland	32,575.72	1.59	1.55	3.13	3.86	5.53	223.50	10.00
Taiwan, China	10,922.80		0.89	2.37	3.88	3.48	210.00	6.75
Thailand	1,803.43	0.91	0.44	3.14	3.38	2.66	210.00	3.25
Turkey	2,680.42	0.16	0.19	2.53	2.88	2.71	105.00	4.00
United Kingdom	21,623.95	1.14	1.26	2.58	4.00	4.96	101.00	10.00
United States	30,716.95	1.26	0.99	2.62	4.00	4.59	365.00	10.00

Table 2
Summary Statistics and Correlations

The variables are defined as follows: SALES is total firm sales in billions of constant US$. TOTAL ASSETS is total firm assets in billions of constant US $. MARKET CAPITALIZATION is a firm's market capitalization, in billions of constant US $. NFATA is the net fixed assets divided by total assets. NSNFA is the net sales divided by net fixed assets. ROA is return on assets. GDP is given in billions of US$. GDP/CAP is real GDP per capita in thousands of US$. INFLATION is the log difference of the Consumer Price Indicator. OPENNESS is given by imports plus exports divided by GDP. EDUCATION is gross enrolment in secondary schools. PRIVATE CREDIT is credit extended to the private sector by banks and other financial institutions, divided by GDP. STOCK MARKET CAPITALIZATION is stock market capitalization divided by GDP. JUDICIAL EFFICIENCY, scored 0 to 10, is a measure of the efficiency and integrity of the legal environment as it affects business, with higher values indicating more efficiency. CONTRACT ENFORCEMENT is a measure of contract efficiency and is the time in calendar days it takes for dispute resolution. CONTROL OF CORRUPTION, scored 0 to 6, is an indicator of the lack of corruption in the government. PROPERTY RIGHTS, scored 1 to 5 is a rating of property rights in each country. LEGAL FORMALISM, scored 1 to 7, is an overall indicator of formalism in commercial dispute resolution. Detailed variable definitions and sources are given in the appendix.

	Observations	Mean	Std. Dev.	Minimum	Maximum
Firm-Level					
SALES	3339	2.15	8.18	0.00	171.30
TOTAL ASSETS	3339	2.43	9.77	0.00	257.25
MARKET CAPITALIZATION	3309	2.13	9.12	0.00	174.01
NFATA	3339	0.37	0.176	0.00	1.40
NSNFA	3339	11.61	265.87	0.00	14,609.63
ROA	3339	6.54	18.18	-732.45	364.54
Country-Level					
GDP	44	577.02	1,377.84	42.14	8,210.00
GDP/CAP	44	12,945.49	10,240.41	376.24	35,138.39
INFLATION	44	0.13	0.24	0.01	1.23
OPENNESS	43	0.68	0.45	0.17	2.46
EDUCATION	43	94.07	26.38	23.86	152.81
PRIVATE CREDIT	44	0.74	0.40	0.15	1.59
STOCK MARKET CAP	44	0.58	0.48	0.08	2.21
LEGAL FORMALISM	44	3.29	1.03	0.73	5.60
PROPERTY RIGHTS	44	3.20	0.84	1.00	4.00
CONTROL OF CORRUPTION	44	4.12	1.14	1.71	6.00
CONTRACT ENFORCEMENT	44	261.86	178.81	39.00	1,000.00
JUDICIAL EFFICIENCY	39	7.79	2.20	2.50	10.00

Table 3
Determinants of Firm Size – Financial and Legal Institutions

The regression estimated is SIZE = β_0 + β_1 NFATA + β_2 NSNFA + β_3 ROA + β_4GDP + β_5GDP/CAP + β_6PRIVATE CREDIT or CONTRACT ENFORCEMENT or PROPERTY RIGHTS . Dependent variable, SIZE, is given by the log of total sales of the firm in billions of constant US$. NFATA is the net fixed assets divided by total assets. NSNFA is the net sales divided by net fixed assets. ROA is return on assets. GDP is given in billions of US$. GDP/CAP is real GDP per capita in US$. Log values of GDP and GDP per capita are used. PRIVATE CREDIT is credit extended to the private sector by banks and other financial institutions, divided by GDP. CONTRACT ENFORCEMENT is a measure of contract efficiency and is the time in calendar days it takes for dispute resolution. PROPERTY RIGHTS, scored 1 to 5 is a rating of property rights in each country. All variables are averaged over the sample period and regressions are estimated including industry dummy variables and clustered at the country level. Detailed variable definitions and sources are given in the appendix.

	1	2	3
NFATA	0.7398***	0.8511***	0.7706***
	[0.2263]	[0.2370]	[0.2302]
NSNFA	-0.0001**	-0.0001**	0
	[0.0000]	[0.0000]	[0.0000]
ROA	0.0083	0.0068	0.0069
	[0.0051]	[0.0047]	[0.0047]
GDP	0.8479***	0.9124***	0.9506***
	[0.0539]	[0.0569]	[0.0566]
GDP/CAP	0.1001	0.2685***	0.0529
	[0.1009]	[0.0599]	[0.1013]
PRIVATE CREDIT	1.0609***		
	[0.2173]		
CONTRACT ENFORCEMENT		-0.0010**	
		[0.0004]	
PROPERTY RIGHTS			0.3800**
			[0.1457]
Observations	3339	3339	3339
R-squared	0.5257	0.5022	0.505

Robust standard errors in brackets
* significant at 10%; ** significant at 5%; *** significant at 1%

Table 4
Robustness Test: Additional Macro Variables

The regression estimated is SIZE = β_0 + β_1 NFATA + β_2 NSNFA + β_3 ROA + β_4 GDP + β_5 GDP/CAP + β_6 INFLATION + β_7 OPENNESS+ β_8 EDUCATION + β_9 PRIVATE CREDIT or CONTRACT ENFORCEMENT or PROPERTY RIGHTS. Dependent variable, SIZE, is given by logarithm of total sales of the firm in billions of constant US$. NFATA is the net fixed assets divided by total assets. NSNFA is the net sales divided by net fixed assets. ROA is return on assets. GDP is given in billions of US$. GDP/CAP is real GDP per capita in US$. Log values of GDP and GDP per capita are used. INFLATION is the log difference of the Consumer Price Indicator. OPENNESS is given by imports plus exports divided by GDP. EDUCATION is gross enrolment in secondary schools. PRIVATE CREDIT is credit extended to the private sector by banks and other financial institutions, divided by GDP. CONTRACT ENFORCEMENT is a measure of contract efficiency and is the time in calendar days it takes for dispute resolution. PROPERTY RIGHTS, scored 1 to 5 is a rating of property rights in each country. All variables are averaged over the sample period and regressions are estimated including industry dummy variables and clustered at the country level. Standard errors are given in brackets. Detailed variable definitions and sources are given in the appendix.

	1	2	3
NFATA	0.7569***	0.8390***	0.7858***
	[0.2458]	[0.2719]	[0.2645]
NSNFA	-0.0001**	-0.0000*	0
	[0.0000]	[0.0000]	[0.0000]
ROA	0.0079	0.0077	0.0077
	[0.0050]	[0.0050]	[0.0050]
GDP	0.8538***	0.9886***	1.0143***
	[0.0681]	[0.0704]	[0.0668]
GDP/CAP	0.1859	0.3190**	0.1719
	[0.1384]	[0.1187]	[0.1487]
INFLATION	0.0404	-0.2301	-0.2017
	[0.1806]	[0.2376]	[0.2471]
EDUCATION	-0.0044	-0.0064	-0.0061
	[0.0044]	[0.0051]	[0.0055]
OPENNESS	-0.0525	0.308	0.2942
	[0.1394]	[0.1839]	[0.1865]
PRIVATE CREDIT	0.9783***		
	[0.2588]		
CONTRACT ENFORCEMENT		-0.0008	
		[0.0005]	
PROPERTY RIGHTS			0.2507
			[0.1629]
Observations	3139	3139	3139
R-squared	0.5323	0.5222	0.5223

Robust standard errors in brackets
* significant at 10%; ** significant at 5%; *** significant at 1%

Table 5
Robustness Test: Controlling for Endogeneity

The first stage regression equation is PRIVATE CREDIT= β_0 + β_1 COMMON + β_2 FRENCH + β_3 GERMAN + β_4 SOCIALIST + β_5 LATITUDE. COMMON, FRENCH, GERMAN and SOCIALIST are legal origin are dummies with value one for countries with the respective legal origin and zero otherwise. LATITUDE is the capital's latitude in absolute terms. The second stage regression estimated is: SIZE = β_0 + β_1 NFATA + β_2 NSNFA + β_3 ROA + β_4GDP + β_5GDP/CAP + β_6 (predicted values of) PRIVATE CREDIT or CONTRACT ENFORCEMENT or PROPERTY RIGHTS. Dependent variable, SIZE, is given by logarithm of total sales of the firm in billions of constant US$. NFATA is the net fixed assets divided by total assets. NSNFA is the net sales divided by net fixed assets. ROA is return on assets. GDP is given in billions of US$. GDP/CAP is real GDP per capita in US$. Log values of GDP and GDP per capita are used. PRIVATE CREDIT is credit extended to the private sector by banks and other financial institutions, divided by GDP. CONTRACT ENFORCEMENT is a measure of contract efficiency and is the time in calendar days it takes for dispute resolution. PROPERTY RIGHTS, scored 1 to 5 is a rating of property rights in each country. All variables are averaged over the sample period and regressions are estimated including industry dummy variables and clustered at the country level. Standard errors are given in brackets. Detailed variable definitions and sources are given in the appendix.

	1	2	3
NFATA	0.6390***	0.7756***	0.5630**
	[0.2309]	[0.2447]	[0.2633]
NSNFA	-0.0001**	-0.0001**	0
	[0.0000]	[0.0000]	[0.0000]
ROA	0.0095*	0.007	0.0073
	[0.0055]	[0.0048]	[0.0049]
GDP	0.8044***	0.9204***	1.0281***
	[0.0719]	[0.0682]	[0.0689]
GDP/CAP	-0.0237	0.2542***	-0.3616*
	[0.1391]	[0.0637]	[0.2063]
PRIVATE CREDIT	1.8151***		
	[0.4046]		
CONTRACT ENFORCEMENT		-0.0033*	
		[0.0020]	
PROPERTY RIGHTS			1.0916***
			[0.3384]
Observations	3339	3339	3339
R-squared	0.5108	0.4655	0.474

Robust standard errors in brackets
* significant at 10%; ** significant at 5%; *** significant at 1%

Table 6
Robustness Test: Alternative Financial and Legal Indicators

The regression estimated is SIZE = β_0 + β_1 NFATA + β_2 NSNFA + β_3 ROA + β_4GDP + β_5GDP/CAP + β_6 STOCK MARKET CAPITALIZATION or LEGAL FORMALISM or JUDICIAL EFFICIENCY or CONTROL OF CORRUPTION. Dependent variable, SIZE, is given by logarithm of total sales of the firm in billions of constant US$. NFATA is the net fixed assets divided by total assets. NSNFA is the net sales divided by net fixed assets. ROA is return on assets. GDP is given in billions of US$. GDP/CAP is real GDP per capita in US$. Log values of GDP and GDP per capita are used. STOCK MARKET CAPITALIZATION is stock market capitalization divided by GDP. LEGAL FORMALISM, scored 1 to 7, is an overall indicator of formalism in commercial dispute resolution. JUDICIAL EFFICIENCY, scored 0 to 10, is a measure of the efficiency and integrity of the legal environment as it affects business, with higher values indicating more efficiency. CONTROL OF CORRUPTION, scored 0 to 6, is an indicator of the lack of corruption in the government. All variables are averaged over the sample period and regressions are estimated including industry dummy variables and clustered at the country level. Standard errors are given in brackets. Detailed variable definitions and sources are given in the appendix.

	1	2	3	4
NFATA	0.8112***	0.9239***	0.7798***	0.8723***
	[0.2591]	[0.2424]	[0.2629]	[0.2672]
NSNFA	-0.0001***	-0.0001**	-0.0001**	-0.0001*
	[0.0000]	[0.0000]	[0.0000]	[0.0000]
ROA	0.0071	0.0065	0.007	0.0068
	[0.0044]	[0.0044]	[0.0047]	[0.0047]
GDP	0.9552***	0.9205***	0.9609***	0.8977***
	[0.0510]	[0.0581]	[0.0521]	[0.0603]
GDP/CAP	0.1767***	0.2335***	0.1029	0.3338***
	[0.0648]	[0.0666]	[0.0869]	[0.1216]
STOCK MARKET CAPITALIZATION	0.5727***			
	[0.1474]			
FORMALISM		-0.1797**		
		[0.0889]		
JUDICIAL EFFICIENCY			0.0982	
			[0.0609]	
CONTROL OF CORRUPTION				-0.0801
				[0.1277]
Observations	3339	3339	3066	3339
R-squared	0.5144	0.5029	0.5211	0.4969

Robust standard errors in brackets
* significant at 10%; ** significant at 5%; *** significant at 1%

Table 7
Robustness Test: Controlling for Different Sample Sizes across Countries

The regression estimated is SIZE = β_0 + β_1 NFATA + β_2 NSNFA + β_3 ROA + β_4GDP + β_5GDP/CAP + β_6 PRIVATE CREDIT or CONTRACT ENFORCEMENT or PROPERTY RIGHTS. Dependent variable, SIZE, is given by logarithm of total sales of the firm in billions of constant US$. NFATA is the net fixed assets divided by total assets. NSNFA is the net sales divided by net fixed assets. ROA is return on assets. GDP is given in billions of US$. GDP/CAP is real GDP per capita in US$. Log values of GDP and GDP per capita are used. PRIVATE CREDIT is credit extended to the private sector by banks and other financial institutions, divided by GDP. CONTRACT ENFORCEMENT is a measure of contract efficiency and is the time in calendar days it takes for dispute resolution. PROPERTY RIGHTS, scored 1 to 5 is a rating of property rights in each country. All variables are averaged over the sample period and regressions are estimated including industry dummy variables and clustered at the country level. Standard errors are given in brackets. Regressions are weighted by the number of observations in each country. Detailed variable definitions and sources are given in the appendix.

	Panel A. Sample restricted to 25 largest firms per country, where available			**Panel B.** Sample weighted by the inverse of the number of firms per country		
	1	2	3	1	2	3
NFATA	-0.1369	-0.1221	-0.1143	0.8431***	0.8955***	0.8527***
	[0.2370]	[0.2611]	[0.2554]	[0.2545]	[0.2773]	[0.2737]
NSNFA	-0.0076***	-0.0072***	-0.0073***	-0.0001*	-0.0001*	-0.0001
	[0.0011]	[0.0012]	[0.0011]	[0.0000]	[0.0000]	[0.0000]
ROA	0.0166***	0.0146**	0.0148***	0.0138*	0.0127*	0.0127*
	[0.0043]	[0.0056]	[0.0052]	[0.0070]	[0.0069]	[0.0069]
GDP	0.9215***	0.9944***	1.0237***	0.7960***	0.8669***	0.8986***
	[0.0939]	[0.0833]	[0.0856]	[0.0677]	[0.0693]	[0.0678]
GDP/CAP	0.1257	0.2804***	0.1497	0.1127	0.2721***	0.1164
	[0.0949]	[0.0661]	[0.1111]	[0.0891]	[0.0602]	[0.1124]
PRIVATE CREDIT	1.0505***			1.0086***		
	[0.2612]			[0.2154]		
CONTRACT ENFORCEMENT		-0.0011***			-0.0005	
		[0.0004]			[0.0004]	
PROPERTY RIGHTS			0.2626			0.2813*
			[0.1746]			[0.1610]
Observations	1081	1081	1081	3339	3339	3339
R-squared	0.6724	0.6547	0.6496	0.4799	0.4575	0.4604

Robust standard errors in brackets
* significant at 10%; ** significant at 5%; *** significant at 1%

Table 8
Robustness Test: Controlling for Exchange Rate Distortions and Sample Period

The regression estimated is SIZE = β_0 + β_1 NFATA + β_2 NSNFA + β_3 ROA + β_4GDP + β_5GDP/CAP + β_6PRIVATE CREDIT or CONTRACT ENFORCEMENT or PROPERTY RIGHTS. Dependent variable, SIZE, is given by the log of total sales of the firm, in billions, converted from local currency to constant international $ using PPP (Panel A) and by the logarithm of total sales of the firm in billions of constant US$, averaged over 1998-2002 (Panel B). NFATA is the net fixed assets divided by total assets. NSNFA is the net sales divided by net fixed assets. ROA is return on assets. GDP is given in billions of US$. GDP/CAP is real GDP per capita in US$. Log values of GDP and GDP per capita are used. PRIVATE CREDIT is credit extended to the private sector by banks and other financial institutions, divided by GDP. CONTRACT ENFORCEMENT is a measure of contract efficiency and is the time in calendar days it takes for dispute resolution. PROPERTY RIGHTS, scored 1 to 5 is a rating of property rights in each country. All variables are averaged over the sample period (Panel A: 1988-2002, Panel B: 1998-2002) and regressions are estimated including industry dummy variables and clustered at the country level. Standard errors are given in brackets. Detailed variable definitions and sources are given in the appendix.

	Panel A. Sample period: 1988-2002			**Panel B.** Sample period: 1998-2002		
	1	2	3	1	2	3
NFATA	0.6982	0.7649	0.6424	0.6917***	0.7443***	0.6750***
	[0.4777]	[0.4697]	[0.4419]	[0.2268]	[0.2284]	[0.2241]
NSNFA	0	0	0.0001**	-0.0001*	-0.0001*	0
	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]
ROA	0.0002	-0.0009	-0.0007	0.0079	0.0075	0.0075
	[0.0015]	[0.0018]	[0.0016]	[0.0053]	[0.0053]	[0.0053]
GDP	0.9792***	1.0238***	1.0745***	0.8914***	0.9220***	0.9566***
	[0.2107]	[0.2157]	[0.2124]	[0.0645]	[0.0581]	[0.0536]
GDP/CAP	-0.0308	0.0786	-0.2072*	0.2016*	0.3054***	0.1148
	[0.1257]	[0.0850]	[0.1175]	[0.1052]	[0.0656]	[0.1014]
PRIVATE CREDIT	0.7032**			0.6484***		
	[0.2981]			[0.2229]		
CONTRACT ENFORCEMENT		-0.0007			-0.0008*	
		[0.0009]			[0.0004]	
PROPERTY RIGHTS			0.5000**			0.3320**
			[0.2323]			[0.1454]
Observations	3239	3239	3239	3224	3324	3324
R-squared	0.2063	0.2041	0.2069	0.5156	0.5019	0.504

Robust standard errors in brackets
* significant at 10%; ** significant at 5%; *** significant at 1%

Table 9
Robustness Test: Alternative Size Definitions

The regression estimated is SIZE = β_0 + β_1 NFATA + β_2 NSNFA + β_3 ROA + β_4GDP + β_5GDP/CAP + β_6PRIVATE CREDIT or CONTRACT ENFORCEMENT or PROPERTY RIGHTS . Dependent variable, SIZE, is given by the assets sales of the firm (Panel A) and market capitalization (Panel B), both measured in billions of constant US$. NFATA is the net fixed assets divided by total assets. NSNFA is the net sales divided by net fixed assets. ROA is return on assets. GDP is given in billions of US$. GDP/CAP is real GDP per capita in US$. Log values of GDP and GDP per capita are used. PRIVATE CREDIT is credit extended to the private sector by banks and other financial institutions, divided by GDP. CONTRACT ENFORCEMENT is a measure of contract efficiency and is the time in calendar days it takes for dispute resolution. PROPERTY RIGHTS, scored 1 to 5 is a rating of property rights in each country. All variables are averaged over the sample period and regressions are estimated including industry dummy variables and clustered at the country level. Standard errors are given in brackets. Detailed variable definitions and sources are given in the appendix.

	Panel A. SIZE = Total Assets			**Panel B**. SIZE = Market Capitalization		
	1	2	3	1	2	3
NFATA	0.0093	0.0112	0.0089	0.0026	0.0053	0.0015
	[0.0080]	[0.0079]	[0.0077]	[0.0100]	[0.0104]	[0.0098]
NSNFA	0	0	0	0	0	0
	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]
ROA	0	-0.0001	-0.0001	0.0002	0.0002	0.0002
	[0.0000]	[0.0001]	[0.0001]	[0.0001]	[0.0001]	[0.0001]
GDP	0.0231***	0.0241***	0.0251***	0.0217**	0.0228**	0.0241**
	[0.0048]	[0.0051]	[0.0051]	[0.0086]	[0.0086]	[0.0090]
GDP/CAP	0.0039	0.0066**	0.0013	0.0038	0.0068**	-0.0002
	[0.0036]	[0.0026]	[0.0036]	[0.0033]	[0.0025]	[0.0045]
PRIVATE CREDIT	0.0170**			0.0182**		
	[0.0082]			[0.0087]		
CONTRACT ENFORCEMENT		0			0	
		[0.0000]			[0.0000]	
PROPERTY RIGHTS			0.0092			0.0119
			[0.0060]			[0.0084]
Observations	3339	3339	3339	3309	3309	3309
R-squared	0.1708	0.1682	0.1699	0.1643	0.1605	0.1644

Robust standard errors in brackets
* significant at 10%; ** significant at 5%; *** significant at 1%

Table 10
Robustness Test: Alternative Estimation Techniques

The regression estimated is SIZE = β_0 + β_1 NFATA + β_2 NSNFA + β_3 ROA + β_4GDP + β_5GDP/CAP + β_6PRIVATE CREDIT or CONTRACT ENFORCEMENT or PROPERTY RIGHTS . Dependent variable, SIZE, is given by the log of total sales of the firm in billions of constant US$. In Panel B, SIZE is defined by industry-adjusted sales, which is the log difference of a firm's total sales and the industry average. NFATA is the net fixed assets divided by total assets. NSNFA is the net sales divided by net fixed assets. ROA is return on assets. GDP is given in billions of US$. GDP/CAP is real GDP per capita in US$. Log values of GDP and GDP per capita are used. PRIVATE CREDIT is credit extended to the private sector by banks and other financial institutions, divided by GDP. CONTRACT ENFORCEMENT is a measure of contract efficiency and is the time in calendar days it takes for dispute resolution. PROPERTY RIGHTS, scored 1 to 5 is a rating of property rights in each country. All variables are averaged over the sample period and regressions are estimated including industry dummy variables and clustered at the country level. Standard errors are given in brackets. Detailed variable definitions and sources are given in the appendix.

	Panel A. Robust Regressions			**Panel B**. Industry-adjusted Sales		
	1	2	3	1	2	3
NFATA	0.5573***	0.6971***	0.5632***	0.7398***	0.8511***	0.7706***
	[0.1445]	[0.1488]	[0.1479]	[0.2263]	[0.2370]	[0.2302]
NSNFA	-0.0001	-0.0001	0	-0.0001**	-0.0001**	0
	[0.0001]	[0.0001]	[0.0001]	[0.0000]	[0.0000]	[0.0000]
ROA	0.0163***	0.0087***	0.0089***	0.0083	0.0068	0.0069
	[0.0018]	[0.0018]	[0.0018]	[0.0051]	[0.0047]	[0.0047]
GDP	0.8360***	0.8956***	0.9418***	0.8479***	0.9124***	0.9506***
	[0.0199]	[0.0201]	[0.0205]	[0.0539]	[0.0569]	[0.0566]
GDP/CAP	0.0830***	0.2613***	-0.0046	0.1001	0.2685***	0.0529
	[0.0222]	[0.0196]	[0.0334]	[0.1009]	[0.0599]	[0.1013]
PRIVATE CREDIT	1.0849***			1.0609***		
	[0.0701]			[0.2173]		
CONTRACT ENFORCEMENT		-0.0011***			-0.0010**	
		[0.0001]			[0.0004]	
PROPERTY RIGHTS			0.4596***			0.3800**
			[0.0468]			[0.1457]
Observations	3338	3338	3338	3339	3339	3339
R-squared	0.547	0.5172	0.5237	0.4996	0.4748	0.4779

Robust standard errors in brackets
* significant at 10%; ** significant at 5%; *** significant at 1%

Table 11
Robustness Test: Proxy for Business Group Membership

The regression estimated is SIZE = β_0 + β_1 NFATA + β_2 NSNFA + β_3 ROA + β_4GDP + β_5GDP/CAP + β_6PRIVATE CREDIT or CONTRACT ENFORCEMENT or PROPERTY RIGHTS + β_7 OWNERSHIP CONCENTRATION. Dependent variable, SIZE, is given by the log of total sales of the firm in billions of constant US$. NFATA is the net fixed assets divided by total assets. NSNFA is the net sales divided by net fixed assets. ROA is return on assets. GDP is given in billions of U.S. dollars. GDP/CAP is real GDP per capita in US. Log values of GDP and GDP per capita are used. PRIVATE CREDIT is credit extended to the private sector by banks and other financial institutions, divided by GDP. CONTRACT ENFORCEMENT is a measure of contract efficiency and is the time in calendar days it takes for dispute resolution. PROPERTY RIGHTS, scored 1 to 5 is a rating of property rights in each country. OWNERSHIP CONCENTRATION – a proxy for business group membership - is a dummy variable whether the ratio of closely held shares to total shares outstanding exceeds a specified threshold (40, 50, and 60 percent in Panels A through C respectively). Panel D reproduces the model in Table 3 with sample size restricted to firms with non-missing ownership concentration data. All variables are averaged over the sample period and regressions are estimated including industry dummy variables and clustered at the country level. Detailed variable definitions and sources are given in the appendix.

	Panel A. Business Group Membership Threshold = 40%			**Panel B Business Group Membership Threshold = 50%**			**Panel C Business Group Membership Threshold = 60%)**			**Panel D. Original Model (Restricted Sample)**		
	1	2	3	1	2	3	1	2	3	1	2	3
NFATA	0.3375	0.4778**	0.4747**	0.3586	0.5039**	0.4978**	0.3926*	0.5468**	0.5310**	0.3758	0.5342**	0.5077**
	[0.2227]	[0.2320]	[0.2282]	[0.2273]	[0.2347]	[0.2332]	[0.2308]	[0.2399]	[0.2373]	[0.2250]	[0.2386]	[0.2360]
NSNFA	-0.0001***	-0.0001***	-0.0001***	-0.0001***	-0.0001***	-0.0001***	-0.0001***	-0.0001***	-0.0001***	-0.0001***	-0.0001***	-0.0001***
	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]
ROA	0.0080*	0.0052	0.0051	0.0082*	0.0054	0.0053	0.0083*	0.0054	0.0054	0.0082*	0.0052	0.0052
	[0.0041]	[0.0043]	[0.0042]	[0.0042]	[0.0043]	[0.0042]	[0.0041]	[0.0044]	[0.0043]	[0.0042]	[0.0045]	[0.0044]
GDP	0.7763***	0.8451***	0.8531***	0.7821***	0.8530***	0.8625***	0.7929***	0.8666***	0.8790***	0.7996***	0.8785***	0.8944***
	[0.0380]	[0.0447]	[0.0501]	[0.0366]	[0.0432]	[0.0477]	[0.0374]	[0.0439]	[0.0472]	[0.0392]	[0.0458]	[0.0485]
GDP/CAP	0.07	0.1973***	0.1283	0.0723	0.2022***	0.1264	0.0789	0.2120***	0.1186	0.094	0.2370***	0.1233
	[0.0669]	[0.0416]	[0.0867]	[0.0670]	[0.0424]	[0.0854]	[0.0708]	[0.0442]	[0.0883]	[0.0739]	[0.0458]	[0.0932]
OWNERSHIP	-0.3914***	-0.4459***	-0.4512***	-0.3693***	-0.4155***	-0.4168***	-0.2506***	-0.2982***	-0.3012***			
CONCENTRATION	[0.0927]	[0.0938]	[0.0968]	[0.0716]	[0.0814]	[0.0844]	[0.0580]	[0.0626]	[0.0648]			
PRIVATE CREDIT	0.9700***			0.9818***			1.0065***			1.0501***		
	[0.1917]			[0.1850]			[0.1931]			[0.2010]		
CONTRACT ENFORCEMENT		-0.0010**			-0.0010**			-0.0010**			-0.0011**	
		[0.0004]			[0.0004]			[0.0004]			[0.0004]	
PROPERTY RIGHTS			0.1232			0.1358			0.1663			0.2024
			[0.1491]			[0.1480]			[0.1528]			[0.1601]
Observations	2654	2654	2654	2654	2654	2654	2654	2654	2654	2654	2654	2654
R-squared	0.5764	0.5601	0.5547	0.5763	0.5597	0.5542	0.5714	0.5539	0.5486	0.5677	0.5487	0.5433

Robust standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

Figure 1. Average Annual Sales (in 2000 US$) per Firm, across Country

This graph shows the average annual sales of up to 100 largest listed firms across the 44 countries in our sample, in billions of constant U.S. dollar

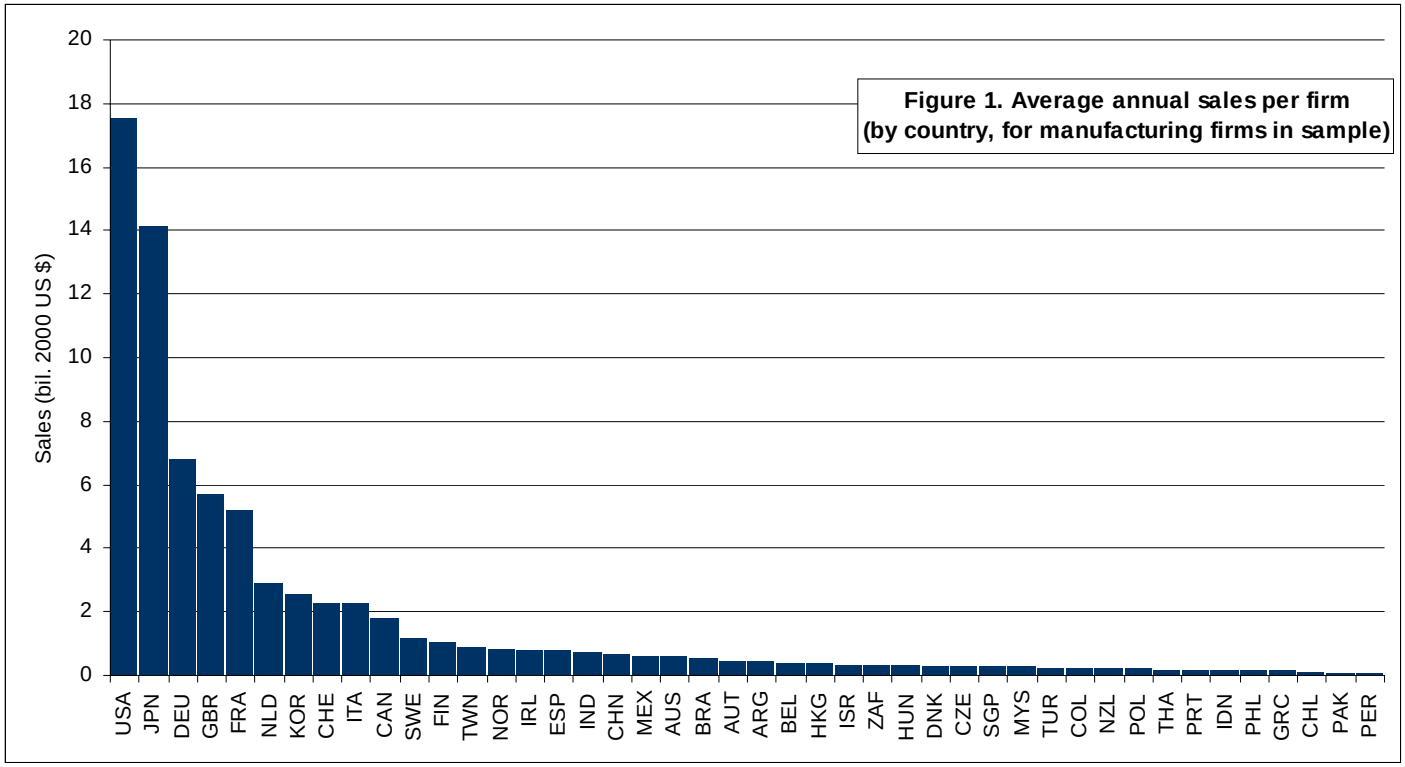

Figure 2. Average Annual Sales (in 2000 US $) by Firm Rank, Across Countries

This graph shows the average annual sales of the largest, second largest, third largest etc. firm, averaged across the 44 countries of our sample, in billions of constant U.S. dollar.