The Quality of the Legal System, Firm Ownership, and Firm Size

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Abstract: Employment in developing countries is disproportionately concentrated in very small firms. We examine the extent to which the distribution of firm size is related to the quality of the legal system using data from Mexico. We find that Mexican states with more effective legal systems have larger firms. A one-standard deviation improvement in the quality of the legal system increases the average firm size by about 10-15 percent. Our data allow us to focus on the differential impact of the legal system on proprietorships and corporations. We show that theoretically, where entrepreneurs face idiosyncratic risk, the legal system will have a larger impact on firm size among proprietorships than among corporations. The data are consistent with this expectation, suggesting that one channel through which better legal systems impact firm size is by reducing the idiosyncratic risk faced by entrepreneurs and increasing the investment in their firms. All of these findings are upheld when we instrument for institutional variables using the log of indigenous population in 1900 and the active presence of the drug trade in the state.

Section 1: Introduction

Firms finance investment through a combination of external and internal funds. Inducing investment from either source depends on some degree of legal protection. Much is now know about the specific channels through which the legal system affects the ability of firms to tap external funds. The willingness of outside equity investors to take a minority ownership position depends on legal protections against tunneling by insiders (La Porta, Lopez de Silanes, Shleifer and Visney, 1997, 1998; Johnson, La Porta, Lopez-de-Silanes, Shleifer 2000). The willingness of banks to lend depends on the ability to capture collateral pledged in support of loans (Levine 1998; Jappelli, Pagano and Bianco, 2004). With respect to investment of internally generated funds, several papers establish a relationship between the willingness to invest and a broad protection of property rights (Besley 1995; Mauro 1995; Johnson, McMillan and Woodruff 2002a**).** The specific channels through which the legal system affects investments by entrepreneurs has only recently begun to be explored. Kumar, Rajan and Zingales [henceforth, KRZ] (2002), for example, show that one channel through which the legal system affects the allocation of invested funds is the protection of intangible assets.

In this paper, we focus on another channel through which the legal system affects the investment decisions of entrepreneurs: the reduction in idiosyncratic risk faced by entrepreneurs. We examine this using data from a census of firms in Mexico, taking the size of firms as representative of the cumulative effect of investment decisions over time. Using data on the legal form of the firms—proprietorships, partnerships and corporations—we examine the relative importance of the legal system on the size of firms owned by a single person (proprietorships) and firms with multiple owners

(partnerships and corporations). An important distinction between these two is that in the former, owners face potentially higher levels of idiosyncratic risk. Controlling owners of partnerships and corporations diversify their risk, albeit at the cost of creating agency problems which may subject outside investors to stealing by insiders.[1] An efficient legal system reduces idiosyncratic risk, lowering the cost of internal investment funds. More efficient legal systems also increase the demand for investment capital by increasing the profitability of investments by a firm. Our data suggest that reduction of idiosyncratic risk is one important channel through which the quality of the legal system affects the investment decisions of entrepreneurs. These results hold when we instrument for the quality of the legal system using indigenous population and drug trafficking (Acemoglu, Johnson and Robinson 2001; Engerman and Sokoloff 2000).

This paper contributes to the literature on the relationship between legal systems and firm finance in three respects. First, our data allow us to focus on the differential impact of the legal system on different legal forms of organization— proprietorships and corporations—while the existing empirical literature generally does not distinguish between different legal types.[2] Second, we focus on firms in a single country in which the legal system arose from a single legal family and in which the most important laws governing commercial transactions are national in scope. As such, the data draw attention to the importance of variation in the administration of justice and the enforcement of legal verdicts. Differences in the efficiency of property registration systems, in the quality of local police, and so forth, lead to differences in the efficiency of the legal system faced

[1] There is a large literature on the agency problems in corporations and partnerships (e.g., Alchian and Demsetz 1972, Holmstrom 1982, and Fama and Jensen 1983).
[2] The related empirical literature on entrepreneurship (e.g., Evans and Leighton 1989 and Evans and Jovanovic 1989) focuses mostly on all entrepreneurs – including sole proprietors, partners, and sole owners of incorporated businesses, but also does not generally distinguish between these different legal types.

by firms located in different regions. Third, the existing empirical literature focuses mostly on data from large, publicly traded firms. Our data are from a census of all firms, giving more weight to small and medium-sized firms.

Our work is related to Kumar, Rajan and Zingales (2002), who examine the determinants of firms size across 13 European countries. KRZ find that more efficient legal systems are associated with larger firm sizes across countries in Western Europe, an effect especially pronounced in industries characterized by low levels of capital intensity. They posit that the reason for this is that all legal systems in Europe are of high enough quality to protect investment in physical capital. Variation among the European countries, therefore, shows up in the more challenging area of intangible assets such as intellectual property. Intangible assets are more important in less capital-intensive industries such as services. Our paper complements KRZ (2002) in that the legal environment in Mexico varies from bad to less bad, while the legal environment in Western Europe varies from good to very good.[3] Hence, protection of more basic financial contracts is less certain in Mexico. Additionally, we examine explanations for firm size distribution other than legal systems, which have been offered in the development literature.

We develop a simple framework which makes two additions to Lucas' (1978) model of firm size. First, we make an explicit consideration of the quality of the legal system. An increase in the effectiveness of the legal system reduces the risk faced by

[3] Levine (1998) uses data from LLSV (1998) and shows that Mexico scores a 5.95 on a scale ranging from 1-10 in a measure of the efficiency with which contracts are enforced. Of the 15 European countries included in the KRZ (2002) sample, 11 score above 9, and an additional 3 between 8 and 9 on the same scale. Only Greece scores below 8, and its score is 6.40. The data in LLSV are averages over the period 1982-1995. More recent data on the LLSV measures show a similar, if not more pronounced, difference between Mexico and the Western European countries. The median rating of the Political Risk Services Group data averaged over the 1990-1999 period on rule of law for the KRZ (2002) sample of countries is 9.72, compared with a rating of 4.73 for Mexico. Even the lowest average score over the period 1990-1999 for the European countries on rule of law, 7.82 for Greece, is well above the score for Mexico.

entrepreneurs, and lowers the rate of return to capital required by entrepreneurs. Second, we consider the effect of idiosyncratic risk faced by the entrepreneurs who invest an increasing share of their wealth in the enterprise. The inclusion of idiosyncratic risk in the framework generates a set of predictions about the relative impact of improvements in the legal system on proprietorships and corporations. We show that the consideration of idiosyncratic risk has an effect on the predicted size distribution of firms.

Taking this framework to the data, we find that firms located in Mexican states with weak legal environments are smaller than those located in states with better legal environments. Moreover, we find that the effect of the legal system is larger for those industries in which proprietorships make up a larger percentage of the firms. The latter finding is consistent with the predictions of the Lucas framework with idiosyncratic risk. As such, the data provide support for the notion that one channel through which the legal system affects firm size is by reducing the idiosyncratic risk faced by entrepreneurs.

Does the quality of the legal system affect the efficiency of the economy through the firm size channel we identify in this paper? The theoretical framework developed here implies an affirmative response to this question. Where a better legal system reduces idiosyncratic risk, capital is allocated more efficiently among entrepreneurs. We return to this issue, and the empirical literature bearing on it, in Section 5 of the paper.

The paper is organized as follows: The next section presents a simple model of the link between firm size, firm ownership, and the quality of the legal system and then discusses the explanations of firm size existing in the literature. Section 3 then describes the data, Section 4 presents regression results, and Section 5 provides some discussion of the results and concludes.

Section 2: Investment, Firm Size, and Legal Institutions

We begin with a discussion of the impact of the legal system on firm size. Our data allow us to differentiate industries in which firms are predominately proprietorships owned by a single person, and industries in which firms are primarily corporations owned by multiple owners. We develop a simple analytical framework based on Lucas' (1978) model determining the distribution of firm size. Our intention is not to break new theoretical ground, but to derive a clear set of empirical predictions for our data by combining the ideas from theoretical papers.

We first consider firm size distributions in an economy of corporations with multiple owners. This establishes a benchmark distribution of firm size, in accordance with the distribution of entrepreneurial talent. We then consider an economy of owner-managed proprietorships. The proprietorships differ from corporations in two ways. First, they have a single owner, who bears all of the risk of losses from the business. Second, the owner's liability is unlimited. Creditors of the business can make claims on the owner's non-business assets. In this environment, we add a consideration of idiosyncratic risk and the quality of the legal system to the Lucas framework. For a fixed level of the entrepreneur's wealth, idiosyncratic risk is increasing in the owner's investment in the firm. We show that idiosyncratic risk has the greatest impact among the highest ability entrepreneurs, those who would otherwise invest the largest amounts. An improvement in the quality of the legal system reduces idiosyncratic risk, allowing an expansion of investment by higher ability entrepreneurs. In the limit, i.e., in a perfect legal system, the distribution among proprietorships will approach that of the benchmark case of the

incorporated economy. The framework suggests that in an economy with a mixture of corporations and proprietorships, the relationship between firm size and the quality of the legal environment will be strongest in sectors where there is a larger proportion of proprietorships.

First, consider an economy composed of corporations only. Entrepreneurs produce output using capital, hired labor, and entrepreneurial input. As in Lucas's original paper, we assume entrepreneurs differ both in skill level and in span of control.[4] Each agent has the potential to produce output Y using labor and capital according to $Y = \Omega \theta K^{(\alpha)} L^{(\beta-\alpha)}$, where $\alpha<\beta<1$. The parameter Ω indicates the quality of the legal system, with $\Omega \in [0, 1]$; θ is a measure of the entrepreneurial talent of the agent, with $\theta \in [0, 1]$, with talent increasing in θ. Every entrepreneur faces decreasing returns to scale,[5] but higher ability entrepreneurs produce higher levels of output both on average and at the margin than do lower ability entrepreneurs.

An entrepreneur with a given talent level produces more output where the legal system is more efficient. One channel through which the legal system affects the production function of an individual firm is through the demand for products. Better legal systems may increase the demand for a given firm's output, by increasing the number of available trading partners. In the absence of legally enforceable contracts, firms may limit transactions to trading partners who are well known to them (Johnson, McMillan and Woodruff, 2002b). Better legal systems allow trading relationships to develop more quickly, and hence expand the market for the lowest cost producers. Higher quality legal

[4] Kihlstrom and Laffont (1979) develop a similar model in which it is the degree of risk aversion rather than entrepreneurial talent that determines whether individuals become entrepreneurs or workers, with the relatively least risk averse becoming entrepreneurs.

[5] Alternatively, we could write the production function as $Y = \Omega K^{(\alpha\theta)} L^{(1-\alpha)\theta}$, in which the scale factor is a function of entrepreneurial ability. This produces identical predictions with additional complexity.

systems may also reduce the cost to firms of hiring workers who are outside their social circles.[6]

Given a continuous distribution of entrepreneurial talent, in equilibrium some agents will choose to become entrepreneurs and some will be wage workers hired by those who become entrepreneurs. The wage rate and rental rate of capital are determined endogenously by demand for capital and labor from entrepreneurs. Each agent weighs the profit from being an entrepreneur against the endogenously determined wage rate. Given that all firms are corporations whose owners are fully diversified, we assume that all face the same interest rate, call it *r*, and pay the same wage rate, call it *w*. Each potential entrepreneur then chooses K and L according to:

$$(1) \qquad w = (\beta - \alpha)\theta\Omega K^{\alpha} L^{(\beta-\alpha-1)}$$

$$(2) \qquad r = \alpha\theta\,\Omega\, K^{\alpha-1} L^{(\beta-\alpha)}$$

Denote the levels of labor and capital that satisfy 1 and 2 as L*(θ) and K*(θ). Then the profit for an agent from self employment is Y(K*(θ), L*(θ)) – wL*(θ) – rK*(θ). For a given level of K and L, an increase in θ results in an increase in the right hand side of (1) and (2). Given that all firms face the same wage and capital rental rates, this implies that higher θ (more able) entrepreneurs will run larger firms. Indeed, Lucas (1978) shows that an equilibrium exists in which agents with the highest levels of entrepreneurial ability become entrepreneurs, and the remaining agents becoming wage workers. The cutoff between wage work and self employment is increasing in the (endogenously determined) wage rate. An increase in the wage rate leads to the lowest ability entrepreneurs closing shop and becoming wage workers. In this equilibrium, the distribution of firm size

[6] At the cost of added complexity, this could be modeled by making the firm's (effective) wage rate a function of the quality of the legal system.

depends on the distribution of entrepreneurial talent and the economy's capital/labor ratio.

We now examine changes in the equilibrium distribution of firm size in an economy at the other extreme, where all firms are proprietorships, each of which is owned by a single agent. Investment comes from the personal wealth of the owner, invested directly or used as collateral for loans. We assume all loans are fully collateralized.[7] Hence, borrowing capital does not reduce the risk to the owner. The owners face unlimited liability for losses incurred operating the business, and are unable to diversify this risk. We assume both the production function and the distribution of entrepreneurial talent are as above. All agents earn the same rate of return on capital invested without risk (perhaps in government bonds) outside the business. However, the risk premium required for capital invested in the business, denoted as ρ, is increasing in the level of investment. For all levels of capital investment, $\rho \geq 1$ and $\rho_K > 0$. A better legal system provides a more certain operating environment, allows firms to protect profits from bureaucrats with kleptocratic tendencies, and so on.[8] Hence, idiosyncratic risk is a decreasing function of the quality of legal enforcement.

As before, maximizing agents choose labor according to equation (1). But the cost of capital now includes a return to idiosyncratic risk, so optimal investment is now:

$$(3) \qquad r\rho(K,\Omega) = \alpha\theta\,\Omega\,K^{\alpha-1}L^{(\beta-\alpha)},$$

[7]This assumption appears reasonable for Mexico, at least with respect to bank loans. See La Porta, Lopez-de-Silanes and Zamarripa (2003).

[8] Besley (1995) shows that improved legal protection of property positively affects investment incentives and provides evidence for the importance of property rights in the context of land ownership by farmers in Ghana. Johnson, McMillan, and Woodruff (2002a) show for a sample of firms in post-communist countries that weaker property rights discourage the reinvestment of firm earnings, even when outside financing is available. Banerjee and Iyer (2002) find that agricultural investment is lower and agricultural production is less capital intensive in Indian states with weaker protection of property rights. Claessens and Laeven (2003) find results that indicate that secure property rights help firms to allocate resources better between tangible and intangible assets and to grow faster.

or:

$$(3a) \qquad r = \frac{\alpha \theta \Omega K^{\alpha-1} L^{(\beta-\alpha)}}{\rho(K,\Omega)}$$

We assume that all agents have similar aversion to idiosyncratic risk, and that the distribution of wealth and entrepreneurial ability are uncorrelated. The effect of idiosyncratic risk on the distribution of firm sizes can be seen by comparing the impact of an increase in θ on the level of capital (and labor) demanded by a single firm in equations (2) and (3a). As in equation 2, an increase in θ results in an increase in the numerator of (3a). At the initial market wage and rental rates, an increase in entrepreneurial ability results in an increase in the investment in both capital and labor. As the level of capital employed increases, however, the denominator of (3a) increases as well. Formally, for equation (2), $\partial^2 Y / \partial K \partial \theta$ is $\alpha \Omega K^{\alpha-1} L^{(\beta-\alpha)}$; for equation (3a), the same cross partial adjusted for idiosyncratic risk is $\frac{\alpha \Omega K^{\alpha-1} L^{(\beta-\alpha)}}{\rho(K,\Omega)}$. Since the level of K is increasing in θ, the latter is smaller, indicating that a change in entrepreneurial ability is associated with a smaller increase in the capital employed. Hence, an increase in entrepreneurial ability is associated with a smaller increase in the size of the firm when idiosyncratic risk is incorporated.

The consideration of idiosyncratic risk reduces the average firm size through an indirect route as well. The reduction in investment by the most able entrepreneurs will result in lower market wage rates. This will induce additional entry into self employment (partially offsetting the initial reduction in wage rates). The new entrants will have lower

entrepreneurial ability than the marginal entrant in the economy without idiosyncratic risk, and hence will employ less capital and labor than the previous marginal entrant.

The situation is depicted in Figure 1, which shows the marginal product of capital for entrepreneurs of high and low ability, and the (equilibrium) market rental rate of capital. Also shown in the graph is the return required to entrepreneurs bearing idiosyncratic risk, given some fixed quality of the legal system. The required return is increasing in the level of capital invested. Idiosyncratic risk decreases the level of capital invested more for high ability entrepreneurs than for low ability entrepreneurs. The distance $\Delta K \mid \theta_L$ shows the reduction in capital investment for a low ability entrepreneur; $\Delta K \mid \theta_H$ shows the same reduction for a high ability entrepreneur. The latter is larger because idiosyncratic risk increases in capital investment.

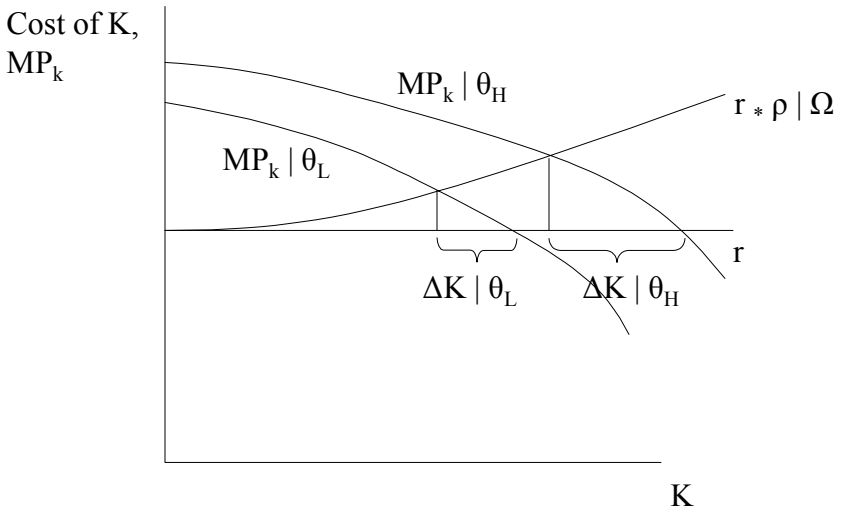

FIGURE 1

With this, we are now ready to consider how an improvement in the quality of the legal system affects the distribution of firm size. The legal system enters the production

function directly, and also impacts investments by reducing the idiosyncratic risk faced by the entrepreneur. The direct production effect of an improvement in the legal system causes an increase in the demand for labor and capital from all entrepreneurs. This puts upward pressure on wage and capital rental rates, inducing the entrepreneurs with the lowest ability levels to leave self employment for wage work. Thus, as above, the direct effect of an improvement in the legal system increases the average firm size by increasing the size of the largest firms and eliminating the smallest firms from the distribution.

An improvement in the legal system also reduces idiosyncratic risk wherever idiosyncratic risk is a factor in investment decisions, that is, where it is not eliminated through dispersed ownership. This will result in an additional increase in firm size wherever proprietorships are important. This gives us two strong predictions to take to the data. First, we should expect firm size to increase with the quality of the legal system under any form of ownership. Second, we should expect the impact of the legal system to be greatest where idiosyncratic risk plays a larger role, i.e., among proprietorships. In the next section, we show that the extent to which proprietorships are important varies across industries, and that inter-industry pattern in Mexico is similar to that in the United States.

Before moving to a discussion of the data, two comments about the framework are warranted. First, our analytical framework develops an argument around the demand for investment capital. Better legal systems might also expand the availability of credit from banks, perhaps by reducing the amount of collateral required for a loan of a given size (Levine 1998; Jappelli, Pagano and Bianco, 2004). Observed firm size may be

impacted by the increase in the supply of finance.[9] We discuss our attempt to deal with this issue empirically in Section 4.

Second, although we have presented the extreme cases of corporate and proprietor economies, all economies in fact have a mixture of proprietorships and corporations. We limit ourselves to a very brief discussion of this issue here, intended only to point out that the effect of an improvement of the legal system on the number of corporations relative to proprietorships is theoretically ambiguous.

Given the advantage that outside owners provide in lowering the level of idiosyncratic risk, there obviously must be some cost in establishing a corporation. Several papers have focused on the threat of stealing, or tunneling, by inside owners (Shleifer and Wolfenzon, 2002; Lamoreaux and Rosenthal, 2003). Himmelberg, Hubbard and Love (2001) find evidence that the ability to tunnel is reduced when the quality of the legal system is improved. Outside ownership also implies the need for formal registration of the firm, and more formal accounting systems (Djankov, La Porta, Lopez-de-Silanes and Shleifer, 2002).

An improvement in the legal system reduces the cost of moving to the corporate form of organization by reducing the cost of finding outside partners. An improvement may also increase the benefits of incorporation by, for example, increasing the demand for the firm's goods (the direct effect of Ω on the production function). However, an improvement in the legal system also reduces the level of idiosyncratic risk among proprietors, reducing the benefits of incorporation and increasing the size of existing

[9] Evans and Jovanovic (1989) find that liquidity constraints negatively impact entrepreneurial activity. Similarly, Guiso, Sapienza, and Zingales (2002) study regional differences across Italy in the choice of being self-employed and find a higher level of entrepreneurial activity in provinces that are more financially developed.

proprietorships. If the latter effect outweighs the former, an improvement in the quality of the legal system could result in an increase in employment in proprietorships relative to corporations. Theoretically, then, after accounting for the effect of idiosyncratic risk, there is no clear prediction with regard to the quality of the legal system and the distribution of legal forms.

In sum, an improvement in the legal system should be associated with an increase in firm size, regardless of the form of ownership. We expect the effect to be larger in industries where proprietorships are more important. There is no clear prediction on the effect of the quality of the legal system on the mix of employment in proprietorships and corporations.

Other factors explaining firm size

While our main interest here is the impact of the legal system on firm size, several other explanations of firm size have been offered by the literature. We review those briefly here, and include them in the regressions as controls.[10] The additional explanations relate to the costs of regulation, levels of generalized trust, the size of the market, and the human capital of managers and workers.

Firms in heavily regulated environments may stay small in order to avoid attracting the attention of regulators. Rauch (1991) develops a model in which firms can avoid at least some of the costs of regulation if they remain small enough to stay under the bureaucrats' radar screen. This framework produces a clear prediction that increasing regulatory costs should be associated with a larger percentage of employment in very

[10] R&D intensity is another potential determinant of firm size (Cohen and Klepper 1996). Due to a lack of data on R&D expenditures for Mexican firms, we do not control for R&D intensity.

small firms, and a smaller overall firm size. An alternative view of the effect of regulation comes from Hopenhayn (1992), who focuses on the regulatory costs associated with the establishment of a new firm. Hopenhayn shows higher entry costs, by deterring entry, can lead to larger average firm size.

Regional data from India and Russia provide some evidence on the connection between the regulatory environment and investment tendencies of firms. For example, Besley and Burgess (2004) find that the burden of labor regulations on businesses varies greatly across states in India, and that more burdensome labor regulations are associated with lower investment, employment, productivity, and output among firms in the manufacturing sector.

Generalized trust is a measure of the extent to which people in a society feel that "most people can be trusted." Theoretically, the effect of generalized trust on firm size is not clear. Higher levels of generalized trust make cooperation easier to sustain, especially in interactions which are infrequent or occur between relative strangers. La Porta, Lopez-de-Silanes, Shleifer and Vishny (1997) argue that such interactions are more likely to occur in very large organizations, and hence employment in large organizations should be increasing in the level of generalized trust. Firms which grow larger by increasing the volume of output they produce—that is, through horizontal integration—also interact with a larger number of trading partners. These interactions are more likely to be successful in environments with higher levels of generalized trust. But firms may also grow larger by integrating vertically. Vertical integration replaces less frequently repeated supplier relationships with more frequently repeated employee relationships. We might, then, expect vertical integration to be decreasing in the level of generalized trust,

and hence a negative correlation between generalized trust and firm size. We leave it to the data to decide the issue.

The size of the market in which the firms sell may also affect the size of firms. One rationale for a connection between firm size and market size is suggested by Rosenstein-Rodan (1943) and Murphy, Shleifer and Vishny (1989). They propose that goods may be produced by either craft or mass production technologies. Smaller markets may not be of sufficient size to support mass production, and the larger firms it brings. The association should be strongest for sectors in which there are large fixed costs of entry. In most of the sectors we examine, however, fixed entry costs appear to be very low even in the largest markets in Mexico (McKenzie and Woodruff, 2003).

Firm size may also be related to market size (as measured by income). One of the implications of the Lucas (1978) model is that firm size will be increasing in per capita income. As incomes increase, wage rates do as well. So long as the elasticity of substitution in production between capital and labor is less than unity, wage rates increase faster than the return to entrepreneurship for the marginal entrepreneur. Hence, the level of entrepreneurial talent representing the cutoff between self employment and wage work increases. The lowest ability entrepreneurs, who manage the smallest firms, shift to wage work, resulting in larger overall firm size. Whatever the underlying cause, KRZ (2002) find a very strong positive relationship between market size and firm size in European data. We include variables measuring the total employment in the sector and state, the log of the state's population, and the log of per capita income in the state. These are discussed in more detail in the next section.

Finally, Hirschman (1958) suggests that entrepreneurial talent might limit entry of firms in developing countries. Entrepreneurial talent is also, of course, central to the model developed by Lucas (1978). We have no direct measures of how the stock of entrepreneurial talent varies across states in Mexico, but we measure this with educational attainment rates. One issue in the data is that educational attainment and per capita income are highly correlated, making it difficult to separate the effects of the two variables.[11]

Section 3: The Data

Our data on firm investment and employment levels come from the Mexican Economic Census of 1998 carried out by Instituto Nacional de Estadística Geografía e Informática (INEGI). Employment and investment data are given in reference to December 31, 1998. The economic census covers the manufacturing, commerce, services and construction sectors. Data are gathered for every location of each firm in Mexico, but the statistics institute (INEGI) does not make the firm level data available. Instead, these data were provided to us at the two digit industry level, by state and by employment size. There are as many as 12 size bins in each state/industry.[12]

There are two important limitations of the data. First, the bins are derived from plant level data. Our framework, and most of the theories explaining firm size distributions, refer to enterprise level data rather than plant data. We have no way to

[11]There is also a literature suggesting that large firms may act strategically to prevent the entry and growth of firms (Gilbert, 1989). Our data do not allow us to test this.

[12] These are 0-2 workers, 3-5 workers, 6-10 workers, 11-15 workers, 16-20 workers, 21-30 workers, 31-50 workers, 51-100 workers, 101-250 workers, 251-500 workers, 501-1000 workers and 1001 or more workers. So, for example, an observation in the data we obtained from INEGI is then the number of firms employing 6-10 workers in the textile industry located in the state of Jalisco.

aggregate the data at the enterprise level. Instead, for the results we report, we limit the sample to domestically-owned firms which operate from a single location within Mexico. Foreign-owned firms are excluded because they are quite likely to have operations outside of Mexico, and may have access to courts in other countries that operate in a different institutional environment. Thus, for all of the firms in our sample, the data are both plant level and enterprise level. Note that even if we could aggregate the data to the firm level, it is not clear what measure of institutional quality would be appropriate for a firm operating in multiple states. Firms with multiple plants located in different states are likely to use courts in different states depending on where disputes arise.[13] We note, however, that all the results we report below are robust to including the foreign-owned and multi-plant firms.

The second issue is that the data are organized according to the number of workers, while the theoretical framework is based on the level of capital stock. This should not be a major concern because there is a strong correlation between labor and capital in the data. The median level of invested capital increases monotonically with the bin size measured by employment. Hence, and increase in employment implies an increase in invested capital.

We exclude several industries that are dominated by government-owned firms: oil and gas extraction, coal mining, water and electricity. We also exclude the fishing industry, both because the industry remains dominated by cooperatives established with

[13] Commercial contracts generally must be adjudicated in the state and city in which the transaction takes place. For financial contracts, contracts involving physical property generally must be registered and adjudicated in the state and city in which the property is located (McNeece and Poelstra, 2003). While it is plausible that firms operating in multiple states have some discretion about where contracts are registered and adjudicated, the single plant firms in our data will be forced to use the courts in the state where the firm is located.

significant government assistance and because the regional location of fishing is determined by geography. Finally, the census data do not include firms involved in agricultural production, though agricultural processing firms are included. There are 32 states and 25 two-digit sectors, resulting in 800 potential state/sector data points. Since some sectors have no employment in some states, we have about 740 observations for most of the regressions.

We start with a comparison of firm size distribution in Mexico and the United States using our data from the Mexican census and data from the U.S. census of firms. Table 1 presents for different size categories the total number of plants and employees for both Mexico and the United States. The data on the distribution of firms by firm size category are presented in panel A, and the data on the distribution of the number of employees by firm size category are presented in panel B of Table 1. The data for Mexico are for the year 1998, and the data for the United States are for the year 1997. We report data both for all firms and for manufacturing firms only. For both Mexico and the US, the tables show plant level data.

The average firm size in Mexico is much smaller than in the United States. While over 96 percent of firms in Mexico employ less than 10 employees, only about 78 percent in the United States do so. As a percentage of the total firms, the number of large firms with more than 500 employees is about eight times larger in the United States than in Mexico.

The differences between Mexico and the United States are even more pronounced for manufacturing firms. The total number of manufacturing firms covered is similar in order of magnitude for both countries, about 340,000 firms. However, these firms employ

a much larger number of employees in the United States (almost 19 million) than in Mexico (just over 4 million). The reason is that a much larger proportion of Mexican firms has only a small number of employees. While only about half of the manufacturing firms in the U.S. employ less than 10 people, in Mexico this number exceeds 90 percent. The numbers confirm Tybout's (2000) observation that employment in developing countries (such as Mexico) is disproportionately concentrated in very small firms, compared to employment in richer countries (such as the United States).[14]

Next, we compare the distribution of legal form of organization in Mexico and the United States. Table 2 presents for different legal form categories the total number of firms and employment for both Mexico and the United States. In Mexico, a much larger share of employment is concentrated in individual proprietorships (38 percent vs. 6 percent in the U.S.). Since the majority of proprietorships are smaller firms, this finding is consistent with the firm size distribution results from Table 1.

Table 3 shows Mexican state level data for two measures of firm size. The firm size measures are based on data for single location, domestically-owned, firms only.[15] The first column shows the simple average firm size, calculated as the sum of employees and contract employees[16] divided by the number of units reported in the census. For Mexico as a whole, there is an average of 13.6 employees per unit reporting in the census, which is close to the average in the median European country reported by KRZ

[14] We find similar results if we compare Mexico with OECD countries other than the United States using data on firm size distribution of firms in OECD countries used before by Cabral and Mata (2003).
[15] The share of multi-plant or foreign-owned firms in total employment ranges from as low as 11 percent in Nuevo Leon to as high as 52 percent in Chihuahua. On average, about 24 percent of employees are employed by multi-plant firms of firms with foreign ownership. These employees are concentrated in the large firms.
[16] In order to avoid labor laws requiring firms to share profits with employees, firms sometimes establish independent entities which exist only to hire and provide workers to the firm. These workers are reported as contract employees.

(2002). As KRZ (2002) point out, the simple average number of employees per firm can be misleading because the average may be brought down by a large number of very small firms.[17] Following Davis and Henrekson (1997), KRZ (2002) suggest an alternative calculation of employee-weighted firm size. Recalling that our data come in bins containing a range of employment totals, the employee weighted firm size is given by: $\sum_{bin=1}^{n} \left(\frac{N_{bin}^{emp}}{N_{\text{sec}}^{emp}}\right) * \left(\frac{N_{bin}^{emp}}{N_{\text{sec}}^{estab}}\right)$, where N_{bin}^{emp} is the total number of employees reported in the given bin, N_{sec}^{emp} is the total number of employees in the sector, and N_{sec}^{estab} is the number of establishments in the sector. This alternative measure of average firm size places more weight on larger firms, and hence dampens the impact of a large number of very small firms. The second column of Table 3 shows the employee-weighted average firm size. Indeed, this produces a significantly larger average firm size. For Mexico as a whole, the average firm size is now just over 1,100 employees, which again is close to the average in the median European country reported by KRZ (2002). Across states within Mexico, there is considerable variation in firm size by either measure. For example, the employee weighted average firm size ranges from 275 in the state of Zacatecas to more than 5,000 in the Federal District.

Legal Institutions

The second major component of our data is the quality of legal institutions. These come from a survey conducted in 1998 under the direction of the Center for the Study of

[17] For example, the average size of firms in an industry in which a single firm hires 10,000 employees and 9 firms hire 1 employee each is roughly 1,000. If the same industry instead had 99 firms hiring 1 employee each, the average firm size would be roughly 100. But in the sense of most theories of firm size, these two industries are not as different as is indicated by the difference in simple average firm size.

Law at the Instituto Tecnológico Autónomo de México (ITAM/GMA 1998).[18] The ITAM project focused on collection of bank debt through local courts in each of Mexico's 32 federal entities. Bank debt was chosen as the focus of the ITAM/GMA study because banks are centralized, but must collect debts in the location of the debtor; that is, they must operate in the courts of each state. From our perspective, the focus of the study on the legal enforcement of financial contracts is fortunate, since finance is clearly an important channel trough which the legal system affects firm growth. The data gathered come from interviews with a total of 519 lawyers working for banks directly and as outside counsel (ITAM/GMA, p. 32).

The relevant commercial laws are national in scope, with only minor variation across states. McNeece and Poelstra (2003), for example, note that "Mexican civil codes [vary] from state to state, though most are based on the Federal Civil Code" (p. 5). The more important variation across states comes from the effect state laws and state legal enforcement have on the application of law by courts and the ability of claimants to enforce verdicts. State laws vary, for example, on the ease with which collateral can be claimed by a victor in a court decision. We construct a measure of the efficiency of legal enforcement in each state by taking an average of the responses to seven different questions. Each of these questions reflects the judgment of lawyers in the survey, and each is scaled of one to five. The questions relate to: (1) the quality of judges (mean value 3.76); (2) the impartiality of judges (1.94)[19]; (3) the adequacy of judicial resources (1.88);

[18] The survey was conducted again in 2001 (Sarre and López Ugalde, 2002.) Using the average of the two surveys rather than just the 1998 survey results in somewhat stronger results in most of the regressions we report in the next section.

[19] Since the survey was administered to layers who generally work for banks, it could be that a high rating on "impartiality" actually reflects a bias in favor of the banks. Given Levine's (1998) finding that rules favoring creditors are associated with higher levels of financial development, we do not see this as a great concern.

(4) the efficiency of enforcement of rulings (2.71); (5) the efficiency of the judicial administration more generally (2.69); (6) the cost, ease of use, and completeness of property registries (3.33); and (7) the adequacy of local legislation related to contract enforcement (3.14). The index is shown in the first column of Table 4, and a graphical presentation of the index across Mexican states is shown in Figure 2.

[INSERT FIGURE 2 HERE]

The data points to rather substantial differences in state-level judicial efficiency (varying from a score of 1.69 to 4.59 on a scale from 1 to 5), suggesting that despite the same legal origin for each state (i.e., Spanish legal origin) there exist stark differences in the practice and enforcement of the law across states.[20] However, Figure 2 makes clear that geography alone does not explain the variation in judicial effectiveness across Mexico. We return to this issue later when we address concerns with endogeneity between judicial effectiveness and firm size.[21]

The Appendix shows the correlation among the 7 components of the index and also a measure of the number of months necessary to prosecute a typical case in the state. The latter measure has been used in several studies as a measure of the effectiveness of the legal system (Jappelli, Pagano and Bianco, 2004). The seven-component index of judicial effectiveness is correlated with the duration measure in the expected way (i.e.,

[20] Figure 2 shows that judicial efficiency tends to be higher in the Northern and Central states of Mexico, as well as in some of the southern states. The states in the Western and Eastern parts of Mexico tend to score low on the judicial effectiveness scale. Aguascalientes, one of the Central states, has the highest score (4.59) and Guerrero, one of the Western states along the Pacific Ocean, has the lowest score (1.69).

[21] Other researchers have noted variation in both the organization and effectiveness of courts across states in Mexico. Cantú and Caballero (2002) show that courts in Mexico differ organizationally in several regards. Negrón Ruiz (2003) discusses the establishment of state judicial councils, which reinforce the independence of the judiciary, in 15 of Mexico's 32 federal entities. (See Fix-Fierro 2003 for a discussion of the importance of the judicial councils). At the state level, many of these characteristics are correlated with the measure of effectiveness we use here. For example, courts in states which provide more information about court cases are more efficient, as are courts in states in which selection and promotion of judges is carried out in a more autonomous fashion.

states in which trials take a longer time to prosecute rate lower on the judicial effectiveness scale, with a correlation coefficient of –0.2) though the correlation is not significant.

A separate survey of business owners provides state level measures of the cost of regulation and a measure of generalized trust. The "Survey of Governance and Development of Enterprises in Mexico" (EGDE) was conducted by the Monterrey Institute of Technology (ITESM) in the first quarter of 2002. The survey gathered data from 3,969 firms, with at least 100 firms responding in each of Mexico's 32 states. We use the responses to two questions from this survey. The first asks managers to identify several categories of costs as a percentage of the firm's revenue. Among the categories is the cost of regulation and regulatory activities.[22] The state-level average cost of regulation is shown in the second column of Table 4. Across Mexico, the business owners reported that regulation costs averaged 3.45 percent of sales, with the state level averages ranging from 1.32 percent to 4.71 percent. The EGDE survey also provides our measure of generalized trust. Managers were asked whether they agreed or disagreed with the statement: "The majority of people are trustworthy." Responses were scaled from 1 (strongly disagree) to 7 (strongly agree). The average responses ranged from 2.7 in the state of Chiapas to 4.1 in several states, with a national average of 3.77. We use the state level average response to this question as our measure of generalized trust.

The final column of Table 4 gives an indication of the level of financial development by state in Mexico as proxied by the ratio of private credit to GDP. These

[22] Cross-country data on the cost of regulations related to the establishment of a business reported in Djankov et al. (2002) indicate that costs of regulation in Mexico are high but not exorbitant compared with other countries. Direct fees and time costs for establishing a business amount to 83 percent of GDP in Mexico, above the world average of 66 percent, but far from the highest in the world.

data are the best available indication on access to finance for firms. However, the data on private credit have two limitations. First, a substantial part of bank lending taking place outside Mexico City is attributed to the Federal District, due to internal reporting procedures at Mexican banks. As a result, credit figures from banks overstate the level of bank activity in the state of the Federal District and understate the level of bank activity elsewhere in the country. In the regressions where we include private credit to GDP, we therefore exclude the observations from the state of the Federal District. Second, as mentioned before, previous research has shown financial market development itself is a function of the efficiency of the legal system (Levine 1998). To address this concern, we use the residual of a regression of private credit to GDP on our measure of judicial efficiency as financial development variable in our regressions.[23]

Legal form

To explore the differential effect of the quality of the legal system on firms with differences in the degree of idiosyncratic risk, we construct a variable measuring the number of firms with limited liability and multiple owners as a percentage of all firms in a particular industry. We will refer to this variable as the incorporation intensity measure. We construct this measure both for Mexico and the United States. The category of firms with limited liability includes corporations and limited partnerships in the United States, and *sociedades anonimas* (SAs) and *sociedades de responsabilidad limitada* (SRLs) in Mexico. For simplicity, we refer to these as the corporate legal form, though in both the

[23] From the 1998 census we only have data on interest expense of firms, not on debt. Interest payments are an imperfect measure of access to finance, and may be jointly determined with the measures of firm size which are our primary focus. Furthermore, interest rates paid by firms are likely to vary across states, industries and firms of different sizes. As a result, we use state level data on the total amount of credit extended as a measure of access to finance.

US and Mexico they include limited partnerships as well. The total number of firms includes these as well as individual proprietorships. We exclude other type of legal forms from these total figures. For Mexico, we also report the share of employment in firms with limited liability and multiple owners.

Table 5 shows the incorporation intensity by industry for both Mexico and the United States. A lower number indicates that proprietorships are a more typical legal form of organization in the given industry. A comparison of the U.S. and Mexican data confirms that the distribution of legal forms is sector-specific. The corporate form tends to be more common in the mining and manufacturing industries, while businesses with unlimited liability are common in the services and retail sectors. [24]

Other Variables

Our regressions also control for the effect of market size, scarcity of entrepreneurial talent, and the presence of dominant firms. Market size is measured with the log of total employment in the sector and state, along with the log of state per capita GDP. The log of population is used as an instrument for state employment in the IV regressions. Data on state per capita income and state population are from INEGI.

The availability of entrepreneurial talent is measured by educational attainment levels at the state level. We use the percentage of the population aged 25 to 40 with at least 9 years of schooling, representing completion of lower secondary schooling, measured using the 1990 population census data. Results using upper secondary (high school) or university attainment are similar.

[24] Incorporation intensity is likely to depend on industry characteristics such as capital intensity, the ease of monitoring worker or manager effort, and so on. At the industry level, the correlation between incorporation intensity in the US and Mexico is 0.34.

Correlations between the measures of firm size and the institutional variables are shown on Table 6. The log average firm size and the log employee-weighted firm size are uncorrelated, but the employee weighted firm size is strongly correlated with the percentage of employment in manufacturing sectors (0.50). There is also a strong positive correlation between size measured by the employee weighted measure and the log population in the state, the log per capita income and the percentage of the population with 9 years or more of schooling. Size is correlated with judicial effectiveness, cost of regulation, and generalized trust in the expected way, though the correlations are significant only when size is measured by the percentage of employment in very small firms and then only for judicial effectiveness (-0.43) and generalized trust (-0.42). The direction of causation of correlations between judicial effectiveness and economic performance is, of course, not clear. This is an issue we will address in the empirical work below.

Section 4: Empirical results

Across industries, the variation in the size of firms is consistent with well established patterns (see the discussion in KRZ 2002). Average firm size is positively associated with capital intensity (measured as fixed assets per worker) and with wage levels. We are more interested in regional variation in the size of firms and we will use information on how institutional variables vary across states to investigate this.

We begin by aggregating all firm size classes at the sectoral level in each state, and by running regressions using the employee weighted firm size at the state/industry level as the dependent variable. The regressions, reported in Panels A and B of Table 7,

have 732 observations across 32 states and 25 industries. Not all industries are represented in each state. Although the regressions are based on state/industry level data, the institutional variables of course vary only at the state level.

The regression model is as follows:

$$Size_{ij} = \alpha_i + \beta \, \mathrm{B}_j + \gamma \, \Gamma_{ij} + \varepsilon_{ij}$$

where $Size_{ij}$ is the average firm size of industry i in state j, α_i is an industry fixed effect, B_j is a vector of state-level variables, Γ_{ij} is a vector of variables that vary by industry and state, and ε_{ij} is the error term. As state-level variables we include the log of per capita income, educational attainment, financial development, and the institutional variables judicial efficiency, cost of regulation, general trust. Market size is measured by the log of total employment in the sector in the state. All regressions include sector level fixed effects.

Panel A in Table 7 reports random effects regressions for the above model.[25] Market size has a very strong and positive effect on firm size. A one standard deviation increase in market size (1.8) is associated with a tripling of the weighted average size of firms. In the reported regressions, educational attainment is never significant, and per capita income is only sometimes significant. The significance of these two variables, however, is affected by collinearity between them. Either is significant at the 1 percent level when the other is excluded from the regression. All three of the institutional variables are significant with no unexpected signs. A one standard deviation increase in judicial effectiveness (0.56) increases the weighted firm size by 13 percent; a one standard deviation decrease in the cost of regulation (1.02) increases firm size by 8

[25] GLS regressions with errors corrected for clustering at the state level produce very similar results.

percent; and a one standard deviation increase in the level of generalized trust (0.31) increases firm size by 11 percent.

Column (4) of Panel A includes the financial development residual variable. In this regression we exclude the observation from the state of the Federal District, because, as we mentioned earlier, the credit figures from banks in the state of the Federal District overstate the level of bank activity in this state. We find that financial development (after controlling for judicial efficiency) is positively associated with firm size, although the effect is not statistically significant.[26]

The fifth column of Panel A includes all three the institutional variables at the same time.[27] We find that the regulatory cost variable changes sign and loses significance. The other variables, including judicial efficiency and generalized trust, change very little from the regressions which include those variables separately and remain statistically significant at the 5 percent level.

Several of the variables in the regressions reported in Panel A may be subject to endogeneity. For example, there may be a direct connection between the presence of larger firms and the development of a more effective judicial system, in that larger firms may demand a better judicial system. We tackle these endogeneity issues by instrumenting for judicial effectiveness, the cost of regulation, the measure of generalized trust, and financial development. For each of these institutional factors, we use two instruments. Following the lead of Acemoglu, Johnson and Robinson (2001) and Engerman and Sokoloff (2000), we use historical data to measure the component of the

[26] We obtain qualitatively similar results for the effect of judicial efficiency on average firm size if we include the level of financial development rather than the financial development residual.
[27] We exclude the financial development and foreign ownership variables, because of their statistical insignificance in the previous regressions. Adding the financial development and foreign ownership variables does not qualitatively change the results.

institutional environment which has deep historical roots. In particular, we use the indigenous speaking people in the state in 1900 as a share of total population in 1900.[28] The *encomienda* system imported by the Spanish treated indigenous labor as a resource to be used by the immigrant Europeans. Hence, a larger share of indigenous people might be expected to be associated with a worse institutional environment. The 1900 data is the earliest measure of indigenous population available to us at the state level.[29]

As a second instrument, we note that Mexico has for a long time played a significant role in the flow of illegal drugs to the United States. In the past two decades, Mexico's role in drug trafficking has increased, especially following the increased intervention efforts along the Florida coast in the 1980s (Smith 1997). Arguably, involvement in drug trafficking is driven by geography rather than institutions. For example, the states along the Pacific coast of Mexico are all heavily involved in the drug trade. We expect that drug trafficking would undermine the quality of government and the level of generalized trust in those states in which trafficking is prevalent. Astorga (undated) lists the states with the largest cocaine seizures, marijuana production, poppy production as well as the states involved in heroin trafficking. We create a variable which takes a value of one if a state is one of the 16 states which shows up on Astorga's list, and zero otherwise. This variable is our second instrument for judicial quality.[30]

[28] An argument could be made that the more appropriate measure is the number of indigenous speaking persons rather than the share. Either instrument produces very similar results. The correlation between the share and the number is 0.77.

[29] The states of Quintana Roo and Baja California Sur were created after 1900, carved out of Yucatán and Baja California, respectively. We use the data from Yucatán and Baja California, respectively. Given that there was essentially no population in 1900 in what is now the state of Quintana Roo, we might alternatively assign Quintana Roo a value of zero for indigenous population. Doing so makes most of the results stronger, so to be conservative we use the data for the Yucatán for Quintana Roo.

[30] The states are Baja California, Baja California Sur, Chiapas, Chihuahua, Colima, the Federal District, Durango, Guerrero, Jalisco, Michoacán, Nayarit, Oaxaca, Quintana Roo, Sonora, Tamaulipas, and Vera Cruz.

The three instruments explain 32 percent, 20 percent and 15 percent of the cross-state variation in judicial effectiveness, costs of regulation, and generalized trust, but only 6 percent of the cross-state variation in the financial development residual variable. The first stage regressions are shown in Panel B of Table 7. Though we employ multiple instruments, all first stage regressions pass the Hansen χ^2 test for overidentification.

Panel C of Table 7 presents the instrumental variables regressions. In addition to instrumenting the institutional variables, each of the regressions also instruments for the size of the market, using the log of the population in the state. The results are consistent with those reported in Panel A. Market size has a somewhat smaller but still substantial impact on firm size. Judicial effectiveness also has a slightly smaller measured effect, while regulatory costs and generalized trust have a larger measured effect. Generalized trust loses statistical significance. Our measure of financial development remains insignificant. A one standard deviation change in judicial efficiency now corresponds to a 12 percent increase in weighted average firm size.

Next, we test whether the legal system has a greater effect on firm size in industries dominated by proprietorships than in those where corporations are more important. To explore this differential effect, we add to the regressions a variable measuring the percentage of firms in the industry which are corporations and the interaction of this term and the measure of the quality of the legal system.

The regression model now looks as follows:

$$Size_{ij} = \alpha_i + \beta\ \mathrm{B}_j + \gamma\ \Gamma_{ij} + \xi\ L_i\ \Omega_j + \varepsilon_{ij}$$

where L_i is the incorporation intensity in industry i and Ω_j is the quality of the legal system in state j. The other variables are as before. Again, all regressions include sector level fixed effects.

Panel A of Table 8 reports both OLS regressions with state and industry fixed effects and regressions with state-level random effects and industry fixed effects. Again, we find that states with a more efficient legal system tend to have larger firms. In addition, we find that sectors in which firms predominantly operate as proprietorships (such as services) tend to have larger firms in states with a better legal environment. In other words, improved legal efficiency is particularly important for the growth of businesses where the owners have unlimited liability. Indeed, the negative coefficient on the interaction term is larger in magnitude than the positive coefficient on judicial efficiency. However, the standard deviation on incorporation intensity is only 0.20, so the combined level and interaction effect is negative only for industries in the far upper tail.

The results are not altered substantially when we instrument for judicial efficiency and the market size variable with the same instruments used in Table 7. These results are presented in column 3 in panel B of Table 8. In fact, the coefficient on the interaction term that is the interaction between judicial efficiency and incorporation intensity increases substantially when we instrument for both market size and judicial efficiency, although its statistical significance reduces somewhat.

We find qualitatively similar results when we define incorporation intensity in terms of employment rather than number of firms (not reported). This is hardly surprising given that the correlation between these two measures at the sectoral level is 0.94.

Although we measure the incorporation intensity variable at the country level, this measure may be subject to endogeneity. For example, differences in judicial effectiveness at the country level may explain variation in the share of incorporated firms at the country level.[31] To ensure that endogeneity is not driving the results, we use data from the 1997 U.S. Economic Census to construct an incorporation intensity variable for the same industries based on U.S. data. In doing this, we presume that firms in the United States do not face major obstacles arising from the institutional environment in their decision to incorporate or not, and therefore the sectoral distribution of legal forms of organization in the United States reflects the optimal distribution of legal forms across industries (see Rajan and Zingales (1998) for a similar argument when studying the external financial dependence of firms).

Panel B in Table 8 reports the results when using the U.S. benchmark data for the incorporation intensity measure rather than Mexican data.[32] The results are qualitatively similar, although the statistical significance of the results drops somewhat. These results suggests that to enhance growth it is important to protect the returns to investments, and that this is particularly important for (small) proprietorships that operate under unlimited liability.

How much does the impact of incorporation intensity vary with the quality of the legal system? A specific example may help clarify what the coefficient on the interaction

[31] The country's legal system defines the organizational forms that firms can assume, and partly determines organizational choices (see, for example, North and Thomas 1973).

[32] These regressions exclude the construction industry. The Mexican economic census is composed of five sub-censuses: manufacturing, services, construction, mining, and financial services. A comparison of data from the census with data from Mexico's National Employment Survey (a household-based survey) indicates that in most of these sectors, a majority of the self employed were included in the census. This is not the case with the construction census, however, which appears to miss almost all of the self employed. Since about 25% of the employees in Mexico's construction sector work by themselves, we exclude the construction industry from our analysis. Note the especially large difference between Mexico and the United States in the proportion of proprietorships in the construction industry (see Table 5).

term means. Take an industry like "repair and maintenance" that is at the 25th percentile of our measure of incorporation intensity (i.e., relatively many proprietorships) and an industry like "wholesale trade" that is at the 75th percentile of incorporation intensity. The coefficient estimate in column (1) in panel B of Table 8 suggests that the difference in average firm size between "repair and maintenance" and "wholesale trade" in Jalisco (that is at the 25th percentile of judicial efficiency) is 0.14 higher than the difference in average firm size between the same industries in Baja California (that is at the 75th percentile of judicial efficiency). In other words, moving from Jalisco to Baja California benefits the sector with a relatively larger proportion of proprietorship relatively more. As a comparison, the mean difference in average firm size between the "wholesale" and "repair and maintenance" sectors across states is 0.83. This suggests that the effect of judicial efficiency accounts for about 17 percent of the mean difference. This is an economically significant effect.

Finally, the results are robust to the exclusion of one industry or state at a time. Hence, no industry or state appears to be driving the results.

Section 5: Conclusions

The average size of firms in Mexico varies with the quality of legal enforcement in the state in which the firm operates. States with more effective legal systems have larger firms. A one-standard deviation improvement in the quality of the legal system increases the average firm size by about 10-15 percent. This finding suggests that the administration of the legal system is an important determinant of the prospects for firm growth. All states in Mexico have the same legal origin, and firms across the country are

governed by essentially the same legal code. What varies is the administration of laws and the enforcement of court verdicts.

The relationship between the quality of legal enforcement and firm size may be the result of any one or a combination of several effects. Better contract enforcement may allow trade with a broader set of trading partners, expanding a firm's market. Courts may also lead to an increase in the availability of external finance. Our empirical results provide some evidence, though, that one channel through which the legal system operates is by reducing the idiosyncratic risk faced by the firm owners. The impact of the legal system is greatest in sectors in which proprietorships dominate. Better legal systems appear to increase the investment of firm owners by reducing the risk faced by owners. These results stand up even when we use U.S. data on the distribution of legal forms of organization. Arguably, the quality of the legal system in the United States offers the basis for an optimal distribution of legal forms, and the U.S. data offer therefore an ideal benchmark of a sector-specific legal organization of businesses. Moreover, all of these findings are upheld when we instrument for the institutional variables using the indigenous population as a share of total population in 1900 and the active presence of the drug trade in the state.

The empirical results are consistent with the theoretical framework developed here. The data provide support for the idea that one channel through which the legal system affects the economy is by relaxing the idiosyncratic risk faced by entrepreneurs. Where entrepreneurs are able to mitigate that risk by diversifying ownership through the corporate form, the legal system has less impact on stimulating investment. The results

suggest that improvements in the effectiveness of the legal system should have the greatest impact among proprietorships, and in sectors dominated by proprietorships.

The theoretical framework implies that increased firm size is associated with increased efficiency in the economy. Where idiosyncratic risk is reduced, capital is allocated more efficiently among entrepreneurs. Thus, theoretically at least, improvements in the quality of the legal system improve the efficiency of the economy. The implication of the theory is that these consequences should show up as increasing returns to scale. The existing literature examining returns to scale among firms in developing countries suggests that returns to scale are modest if present at all (Tybout 2000). However, most of this literature is limited to an examination of the manufacturing sector. One exception to this finding is the recent paper by Pagano and Schivardi (2003), which finds that productivity growth is increasing in firm size across a set of industries in Europe. Like our paper, the Pagano and Schivardi paper uses data from both manufacturing and service sectors, where the presence of proprietorships is much greater. These papers suggest that exploring economies of scale in non-manufacturing sectors might be a fruitful area for future research.

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Table 1. Firm Size Distribution in Mexico and the United States

Panel A presents data on the distribution of firms by firm size category for Mexico and the United States, and Panel B presents data on the distribution of the number of employees by firm size category for Mexico and the United States. The firm size categories are based on the number of employees. All data are measured at the plant level. The data for Mexico are for the year 1998, and the data for the United States are for the year 1997. The source of the Mexican data is the 1998 Mexican census of firms from INEGI. The source of the U.S. data is the 1997 U.S. Economic Census from the U.S. Department of Commerce. Both panels report data for all firms and for manufacturing firms only.

Panel A: Share in total number of establishments, by size category

	All firms		Manufacturing firms	
Size category	Mexico	US	Mexico	US
0 to 9 employees	96.09%	63.51%	90.29%	49.11%
10 to 19 employees	2.03%	9.22%	3.79%	13.99%
20 to 99 employees	1.54%	9.72%	3.94%	19.18%
100 to 499 employees	0.30%	4.43%	1.58%	7.19%
More than 500 employees	0.04%	13.13%	0.40%	10.53%
Total number of establishments	2,804,984	6,941,822	344,118	366,443

Panel B: Share in total number of employees, by size category

	All firms		Manufacturing firms	
Size category	Mexico	US	Mexico	US
0 to 9 employees	38.50%	11.31%	18.47%	3.61%
10 to 19 employees	6.43%	7.44%	4.53%	4.11%
20 to 99 employees	15.80%	17.92%	13.94%	16.21%
100 to 499 employees	18.41%	14.25%	28.15%	17.46%
More than 500 employees	20.87%	49.07%	34.90%	58.61%
Total number of employees	13,827,025	108,117,731	4,232,322	16,946,142

Table 2. Legal Form of Organization Distribution in Mexico and the United States

This table presents the percent distribution of firms by legal form of organization for Mexico and the United States. The first two columns present the share in total number of firms by legal form category and the last two columns present the share in total number of employees by legal form category. For Mexico, partnerships are sociedad de responsabilid limitada (SRLs) and corporations are sociedad anonima (SAs). For the U.S., partnerships include mostly limited liability partnerships (LLPs), but also general partnerships and limited partnerships.

	Share in total number of firms		Share in total number of employees	
Legal form category	México	US	México	US
Proprietorships	89.0%	72.6%	37.9%	5.5%
Partnerships	0.2%	5.9%	1.9%	3.8%
Corporations	8.1%	21.0%	50.5%	89.4%
Other	2.7%	0.5%	9.7%	1.3%
Total	2,804,984	5,295,151	13,827,025	103,359,815

Table 3. Firm Size and Distribution of Employment by State

Average firm size and employee weighted average firm size are calculated as described in the text. All figures exclude firms in the electricity, water, oil and gas extraction, coal mining, and fishing sectors. All figures exclude firms with multiple establishments and firms with foreign ownership.

State	Average firm size	Employee weighted average firm size
Aguascalientes	8.3	918.0
Baja California	42.4	2473.7
Baja California Sur	6.5	398.9
Campeche	6.4	299.9
Chiapas	5.0	243.9
Chihuahua	11.2	1465.0
Coahuila	31.1	1755.1
Colima	6.5	309.0
Distrito Federal	20.8	5356.4
Durango	13.0	942.6
Guanajuato	8.3	1214.8
Guerrero	6.9	439.9
Hidalgo	12.3	697.2
Jalisco	12.7	1732.5
México	19.5	2066.4
Michoacán	7.0	477.8
Morelos	8.1	520.9
Nayarit	6.9	373.6
Nuevo León	17.5	2672.2
Oaxaca	9.3	352.2
Puebla	9.1	888.0
Querétaro	17.8	1430.0
Quintana Roo	9.4	616.5
San Luis Potosí	17.2	1008.8
Sinaloa	11.6	644.1
Sonora	15.9	1043.5
Tabasco	8.3	601.5
Tamaulipas	9.8	1302.7
Tlaxcala	6.6	474.3
Veracruz	46.2	1204.7
Yucatán	10.6	828.5
Zacatecas	11.6	274.6
Total	13.6	829.5

Table 4. Judicial Efficiency, Regulation, Trust, and Financial Development by State

Judicial efficiency is based on survey data from ITAM/GMA at year-end 1998 and is measured as the average of seven individual indicators (each on a scale from 0-5): Perceived quality of judges; perceived impartiality of judges; adequacy of resources for materials; efficiency in the enforcement of resolutions; efficiency of public ministry of justice; efficiency of public registry of real estate property; and adequacy of local legislation for the enforcement of contracts. Judicial efficiency are constructed such that a higher score indicates more efficiency. The measures of regulation and general trust are taken from responses to the Survey of Governance and Development of Enterprises in Mexico conducted by ITESM in 2001. Regulation is the reported percentage of sales expended on regulatory costs, averaged at the state level (expressed as a % of sales). Generalized trust is a response on a scale of 1 (disagree) to 7 (agree) to the statement: "Most people can be trusted." Financial development is private credit to GDP in 2000 at the state-level. The data are from INEGI.

State	Judicial efficiency	Cost of regulation	Generalized trust	Financial development
Aguascalientes	4.59	2.82	4.1	0.13
Baja California	3.14	4.71	3.5	0.10
Baja California Sur	2.53	3.33	3.9	0.05
Campeche	3.21	3.73	3.6	0.03
Chiapas	2.97	4.70	2.7	0.06
Chihuahua	2.71	4.41	3.9	0.08
Coahuila	3.40	2.16	3.8	0.09
Colima	3.14	3.97	3.8	0.07
Distrito Federal	2.53	4.38	3.7	0.67
Durango	3.34	2.44	4.0	0.06
Guanajuato	3.03	1.88	3.8	0.10
Guerrero	1.69	5.57	3.1	0.03
Hidalgo	2.11	3.55	3.5	0.03
Jalisco	2.39	2.66	3.9	0.15
México	3.20	4.79	3.5	0.07
Michoacán	1.94	3.48	3.7	0.07
Morelos	3.27	3.27	3.8	0.07
Nayarit	2.49	2.30	3.7	0.04
Nuevo León	3.00	3.00	4.1	0.26
Oaxaca	2.64	4.55	3.5	0.02
Puebla	2.54	3.49	3.4	0.10
Querétaro	3.24	1.32	3.8	0.08
Quintana Roo	2.46	3.88	4.1	0.10
San Luis Potosí	2.84	2.95	4.1	0.08
Sinaloa	2.67	2.21	4.0	0.19
Sonora	3.06	2.61	4.1	0.18
Tabasco	3.11	4.43	3.7	0.09
Tamaulipas	3.01	4.51	3.7	0.06
Tlaxcala	2.19	3.75	3.8	0.04
Veracruz	2.20	4.42	3.8	0.06
Yucatán	2.03	3.03	4.2	0.12
Zacatecas	2.26	2.32	4.1	0.04
Total	2.78	3.45	3.77	0.10

Table 5. Legal Forms of Organization by Sector in Mexico and the United States

This table shows the importance of legal persons with limited liability versus physical persons with unlimited liability by industrial sector for both Mexico and the United States. Incorporation intensity is the share of legal persons with limited liability in the total number of firms. The category of legal persons with limited liability includes corporations and partnerships in the United States, and sociedades anonimas (SAs) and sociedades de responsabilidad limitada (SRLs) in Mexico. The total number of firms includes individual proprietorships. We exclude other type of legal forms from these total figures. For Mexico, we also report the share of legal persons with limited liability in the total number of employees.

		Incorporation intensity		
Sector	Sector code	Mexico (number of firms)	United States (number of firms)	Mexico (employees)
Mining of metals	23	0.60	0.47	0.84
Mining of non-metals	29	0.19	0.61	0.40
Food, beverages, and tobacco	31	0.04	0.60	0.21
Textiles and leather	32	0.11	0.41	0.42
Lumber products	33	0.05	0.29	0.23
Paper products and printing	34	0.20	0.50	0.44
Chemicals, pharmaceuticals, and plastics	35	0.49	0.94	0.68
Ceramics, glass, and clay	36	0.04	0.41	0.23
Basic metals	37	0.78	0.70	0.89
Metal products and equipment	38	0.13	0.62	0.45
Other manufacturing	39	0.08	0.43	0.37
Construction	50	0.76	0.26	0.91
Wholesale	61	0.27	0.55	0.44
Retail	62	0.03	0.30	0.08
Transport	71	0.12	0.22	0.35
Communications	72	0.19	0.37	0.52
Real estate	82	0.29	0.58	0.42
Leasing	83	0.09	0.18	0.21
Education and medical services	92	0.03	0.22	0.08
Restaurants and hotels	93	0.04	0.48	0.16
Recreation	94	0.08	0.20	0.21
Professional services	95	0.09	0.16	0.36
Repair and maintenance	96	0.03	0.26	0.09
Other services	97	0.40	0.13	0.55
Total		0.20	0.57	0.38

Table 6. Correlation of Size and Constraint Variables

Size is measured as the weighted average of average firm size in each of the bins, as described in the text. On the constraints side, judicial efficiency is based on survey data from ITAM/GMA at year-end 1998 and is measured as the average of seven individual indicators (each on a scale from 0-5): Perceived quality of judges; perceived impartiality of judges; adequacy of resources for materials; efficiency in the enforcement of resolutions; efficiency of public ministry of justice; efficiency of public registry of real estate property; and adequacy of local legislation for the enforcement of contracts. Judicial efficiency is constructed such that a higher score indicates more efficiency. The measures of regulation and general trust are taken from responses to the Survey of Governance and Development of Enterprises in Mexico conducted by ITESM in 2001. Regulation is the reported percentage of sales expended on regulatory costs, averaged at the state level. generalized trust is a response on a scale of 1 (disagree) to 7 (agree) to the statement: "Most people can be trusted." Financial development is the ratio of private sector to GDP in 2000 from Mexican Statistical Institute (INEGI). Log population are from the Mexican population census of 2000 and log GDP per capita is from the Mexican Statistical Institute (INEGI), also for 2000. Schooling is represented by the percentage of adult population in the state with at least lower secondary (9 years) education, measured by the 1990 census. * denotes significance at 10 percent; ** denotes significance at 5 percent; and *** denotes significance at 1 percent.

	Weighted average firm size	Measure of judicial effectiveness	Cost of regulation	Generalized trust measure	Financial development	Log population	Log GDP per capita
Measure of judicial effectiveness	0.208						
Cost of regulation	-0.050	-0.236					
Generalized trust measure	0.235	0.150	***-0.582				
Financial development	***0.628	0.031	-0.010	0.170			
Log population	***0.575	-0.183	0.272	*-0.314	**0.372		
Log GDP per capita	***0.592	**0.380	-0.085	**0.391	**0.566	-0.121	
Schooling	***0.653	0.228	-0.026	*0.327	**0.636	0.034	***0.805

Table 7. Cross-State Determinants of Firm Size Distribution

The dependent variable is the logarithm of the weighted average firm size calculated as described in the text. Panel A reports regressions at the state/industry level with random state effects, while Panel B reports IV regressions at the state/industry level. All regressions exclude the electricity, water, oil and gas extraction, coal mining, and fishing industries. Industry fixed effects are included, but not reported. All regressions include a measure of the size of the market, measured as the logarithm of total employment in that two-digit industry in a state. Per capita income is the log of per capita income for each state. Human capital is measures as the share of population in each state aged 15 years and over with at least 9 years of schooling education in 1990. Judicial efficiency is based on survey data from ITAM/GMA at year-end 1998 and is measured as the average of seven individual indicators (each on a scale from 0-5): Perceived quality of judges; perceived impartiality of judges; adequacy of resources for materials; efficiency in the enforcement of resolutions; efficiency of public ministry of justice; efficiency of public registry of real estate property; and adequacy of local legislation for the enforcement of contracts. Judicial efficiency is constructed such that a higher score indicates more efficiency. The measures of regulation and general trust are taken from responses to the Survey of Governance and Development of Enterprises in Mexico conducted by ITESM in 2001. Regulation is the reported percentage of sales expended on regulatory costs, averaged at the state level. generalized trust is a response on a scale of 1 (disagree) to 7 (agree) to the statement: "Most people can be trusted." Financial development is the residual of a state-level regression with the ratio of private credit to GDP as dependent variable and the measure of judicial efficiency as independent variable. The data on state-level private credit and GDP are from INEGI and for the year 2000. The regressions that control for financial development exclude the state of the Federal District. The instruments for judicial efficiency, cost of regulation, generalized trust, and access to finance are drug trafficking and the share of the indigenous population in 1900, and the instrument for the size of the market is the log of state population. Heteroskedasticity-robust standard errors are reported in parentheses. Standard errors in the IV regressions correct for potential dependence of observations within states (clusters). * denotes significance at 10 percent; ** denotes significance at 5 percent; and *** denotes significance at 1 percent.

Panel A: Random effects, weighted average firm size

	(1)	(2)	(3)	(4)	(5)	(6)
Market size	0.617***	0.635***	0.635***	0.639***	0.621***	0.629***
	(0.031)	(0.033)	(0.034)	(0.033)	(0.031)	(0.033)
Per capita income	0.240	0.315*	0.369**	0.277*	0.153	0.329
	(0.149)	(0.164)	(0.166)	(0.156)	(0.148)	(0.165)
Schooling	0.368	-0.011	0.117	0.631	0.315	0.3622
	(0.650)	(0.735)	(0.757)	(0.689)	(0.629)	(0.797)
Judicial efficiency	0.229***			0.180**	0.234***	
	(0.074)			(0.081)	(0.074)	
General trust		0.343**			0.357**	
		(0.151)			(0.161)	
Cost of regulation			-0.076*		0.012	
			(0.044)		(0.047)	
Financial development				0.102		
				(0.099)		
Log duration of cases (months)						-0.015*
						(0.008)
R-squared	0.68	0.68	0.68	0.68	0.69	0.68
States	32	32	32	31	32	32
Observations	738	738	738	715	738	738

Panel B: First stage instrumental variables (IV) results

	(1) Judicial Efficiency	(2) General Trust	(3) Cost of Regulation	(4) Financial Development	(5) Duration of cases
Log population	-0.065	-0.11**	0.32*	-0.066	0.33
	(0.100)	(0.045)	(0.18)	(0.06)	(0.98)
Share of indigenous	-1.38**	-0.35	2.62**	-0.34	9.82*
population, 1900	(0.64)	(0..43)	(1.00)	(0.61)	(1.68)
Drug trafficking	-0.264	-0.14	0.80***	-0.09	2.30
	(0.16)	(0.10)	(0.29)	(0.13)	(1.88)
Partial R-square	0.22	0.19	0.36	0.05	0.11
Hansen χ^2	0.66	0.02	0.22	0.11	0.70
Hansen p-value	0.42	0.90	0.64	0.74	0.71
Observations	738	715	738	738	738

Panel C: Second stage instrumental variables (IV) results, weighted average firm size

	(1)	(2)	(3)	(4)	(5)
Market size	0.472***	0.544***	0.496***	0.539***	0.465***
(IV)	(0.037)	(0.067)	(0.076)	(0.072)	(0.038)
Per capita income	0.138	0.158	0.303***	0.196	0.169
	(0.149)	(0.161)	(0.108)	(0.184)	(0.201)
Schooling	1.112	0.365	0.827	2.108*	2.331*
	(0.793)	(1.022)	(0.776)	(1.305)	(1.237)
Judicial efficiency	0.324**				
(IV)	(0.161)				
General trust		0.874*			
(IV)		(0.527)			
Cost of regulation			-0.145*		
(IV)			(0.076)		
Financial development				1.023	
(IV)				(1.305)	
Log duration of cases					-0.041
(months)					(0.026)
R-squared	0.67	0.67	0.67	0.61	0.66
States	32	32	32	31	32
Observations	738	738	738	715	738

Table 8. Firm Size Distribution and Legal Form

The dependent variable is the weighted average firm size calculated as described in the text. All regressions include a measure of the size of the market, measured as the logarithm of total employment in that two-digit industry in a state. Per capita income is the log of per capita income for each state. Human capital is measures as the share of population in each state aged 15 years and over with at least 9 years of schooling education in 1990. Judicial efficiency is based on survey data from ITAM/GMA at year-end 1998 and is measured as the average of seven individual indicators (each on a scale from 0-5): Perceived quality of judges; perceived impartiality of judges; adequacy of resources for materials; efficiency in the enforcement of resolutions; efficiency of public ministry of justice; efficiency of public registry of real estate property; and adequacy of local legislation for the enforcement of contracts. Judicial efficiency is constructed such that a higher score indicates more efficiency. The incorporation intensity variable used in panel A is based on data from the 1998 Mexican Economic census, while for panel B this variable is based on data from the 1997 U.S. Economic Census. Column (1) in Panels A and B reports OLS estimates with industry fixed effects and state fixed effects (not reported) and heteroskedasticity-robust standard errors. Column (2) in Panels A and B is estimated using random state effects with industry fixed effects (not reported). Column (3) in Panels A and B is estimated using IV and do not include state fixed effects, but do include industry fixed effects (not reported). The instruments for judicial efficiency and generalized trust are drug trafficking and the share of the indigenous population in 1900, and the instrument for the size of the market is the log of state population. Standard errors in the IV regressions correct for potential dependence of observations within states (clusters). All regressions exclude the electricity, water, oil and gas extraction, coal mining, and fishing industries. The regressions in panel B also exclude the construction industry. * denotes significance at 10 percent; ** denotes significance at 5 percent; and *** denotes significance at 1 percent.

Panel A: Mexican data for incorporation intensity

	Fixed effects (1)	Random effects (2)	Instrumental variables (3)
Market size	0.743***	0.624***	0.474***
	(0.043)	(0.032)	(0.037)
Per capita income		0.239	0.138
		(0.152)	(0.152)
Schooling		0.367	1.133
		(0.661)	(0.806)
Judicial efficiency		0.365***	0.491**
		(0.089)	(0.203)
General trust			
Judicial efficiency *	-0.755***	-0.710***	-0.881**
Incorporation intensity	(0.243)	(0.246)	(0.418)
R-squared	0.65	0.68	0.67
States	32	32	32
Observations	738	738	738

Panel B: U.S. data for incorporation intensity

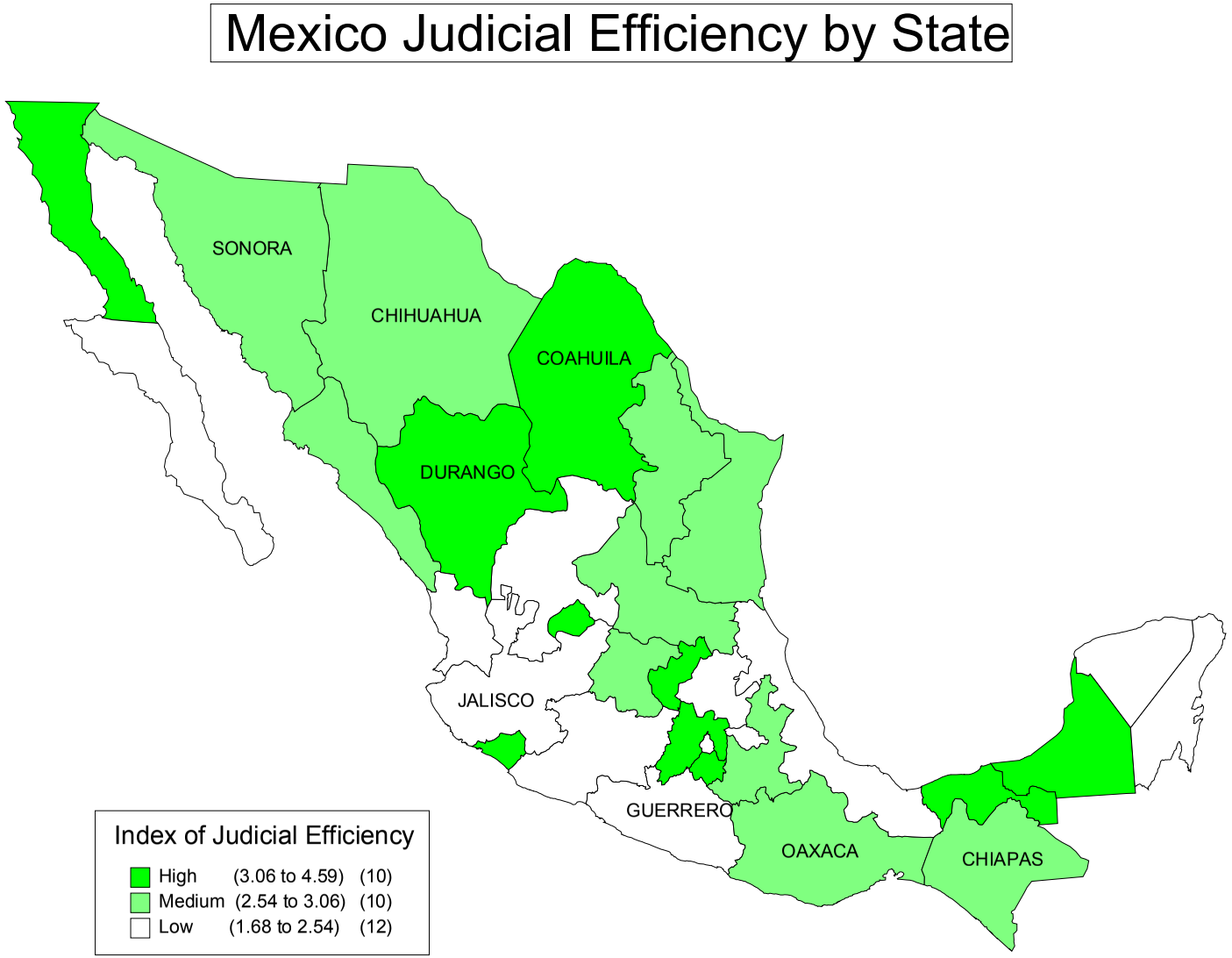
	Fixed effects (1)	Random effects (2)	Instrumental variables (3)
Market size	0.739***	0.625***	0.476***
	(0.054)	(0.032)	(0.038)
Per capita income		0.271*	0.233
		(0.154)	(0.152)
Schooling		0.229	0.891
		(0.671)	(0.781)
Judicial efficiency		0.492***	0.609***
		(0.143)	(0.209)
Judicial efficiency *	-0.641**	-0.578**	-0.872*
Incorporation intensity U.S.	(0.268)	(0.294)	(0.484)
R-squared	0.69	0.66	0.65
States	32	32	32
Observations	706	706	706

Appendix Table 1. Components of Judicial Effectiveness Variables

Judicial efficiency is based on survey data from ITAM/GMA at year-end 1998 and is measured as the average of seven individual indicators (each on a scale from 0-5): Perceived quality of judges; perceived impartiality of judges; adequacy of resources for materials; efficiency in the enforcement of resolutions; efficiency of public ministry of justice; efficiency of public registry of real estate property; and adequacy of local legislation for the enforcement of contracts. Judicial efficiency are constructed such that a higher score indicates more efficiency. Additional measures are the percentage of the state's budget dedicated to the judiciary branch, the salary of judges relative to workers with university education in the private sector, and the average number of months needed to prosecute a case involving collection of bank debt. All measures of judicial efficiency except duration of cases are constructed such that a higher score indicates more efficiency. * denotes significance at 10 percent; ** denotes significance at 5 percent; and *** denotes significance at 1 percent.

	Quality of judges	Impartiality of judges	Adequacy of resources	Efficiency of enforcement	Efficiency of ministry of justice	Efficiency of public registry	Adequacy of local laws	Duration of cases
Impartiality of judges	0.251							
Adequacy of resources	0.293	***0.648						
Efficiency of enforcement	-0.040	0.231	***0.468					
Efficiency of ministry of justice	-0.076	0.222	**0.427	***0.994				
Efficiency of public registry	*0.388	*0.307	*0.307	0.068	0.021			
Adequacy of local laws	-0.126	-0.171	0.048	*0.343	*0.328	-0.152		
Duration of cases	**-0.352	-0.222	-0.258	-0.004	0.050	-0.107	0.121	
Overall measure of judicial effectiveness	*0.333	***0.606	***0.799	***0.776	***0.743	*0.334	**0.334	-0.174

Figure 2


Mexico Judicial Efficiency by State
SONORA
CHIHUAHUA
COAHUILA
DURANGO
JALISCO
GUERRERO
OAXACA
CHIAPAS
Index of Judicial Efficiency
High (3.06 to 4.59) (10)
Medium (2.54 to 3.06) (10)
Low (1.68 to 2.54) (12)