

# **Contracting Frictions and Cross-Border Capital Flows: Evidence from Venture Capital\***

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November 2008

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# **Contracting Frictions and Cross-Border Capital Flows: Evidence from Venture Capital**

## Abstract

Analyzing a large sample of cross-border investments by U.S. venture capital firms, we find that average round sizes and the fraction of financing raised in the first round are larger for companies in countries with poorer legal enforcement. This evidence, which is consistent with third-best contracting where investors take larger stakes to mitigate contractual enforcement problems, suggests that the staging of investments in weak enforcement countries may be less than an optimal. We develop a contracting friction measure, based on the degree of sub-optimal staging, and find that it is negatively related to aggregate cross-border venture capital flows. We interpret the evidence as consistent with a “staging channel” through which frictions that lead to third-best contracting and sub-optimal staging limit cross-border investment.

## 1. Introduction

Beginning with La Porta, Lopez-de-Silanes, Shleifer and Vishny (1997, 1998), a large and growing law and finance literature documents the importance of the legal environment for financial decision-making and development, with a particular focus on the development and functioning of public capital markets. In this paper, we examine the availability of private capital in countries with weak investor protection.<sup>1</sup>

Private equity investors, and venture capitalists in particular, are specialized investors with considerable contracting sophistication and monitoring ability that need not rely on the rules and institutions governing a country's public equity markets.<sup>2</sup> Though we show that private equity is not affected by the same legal rules and institutions that have been shown to affect public equity markets, the ability of venture capital to bridge the financing gap for countries with less developed capital markets is limited. We provide evidence that frictions likely related to weak contract enforcement are a limiting factor in venture capital flows.

Several recent papers have explored the role of the legal environment in the context of cross-border venture capital investing. Lerner and Schoar (2005), using a sample of private equity contracts in developing countries, examine contract provisions as a function of legal origin and time to dispute resolution. They find that countries with civil law origins and lower dispute resolution ability are associated with contracts that are further away from optimal (second-best) contracting, arguing for a "contractual channel"

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<sup>1</sup> At least in the U.S., private firms play an important role for job creation and economic growth. The importance of private equity markets may be especially important in countries where the relative size of public markets is much smaller.

<sup>2</sup> Although venture capitalists often rely on public offerings to exit investments, the ability to cross-list can overcome shortcomings in the investee country's public equity markets.

through which underdevelopment persists in countries with poor legal enforcement. Two other studies stress the importance of the legal environment of the investor's country rather than that of the investee's. Kaplan, Martel and Strömberg (2006) document similar differences in venture capital contracts across countries to Lerner and Schoar (2005), but find that contracts are more similar to second-best U.S.-style contracts the more sophisticated the investor or the greater the exposure to U.S. venture capitalists. After controlling for these factors, they find that the legal environment variables are no longer significant.<sup>3</sup> Similarly, Bottazzi, Da Rin, and Hellmann (2007), using data from a hand-collected survey of European venture capital investors, find that legal variables in the target country do not matter in determining the downside protection demanded or non-contractible support provided after controlling for investor home country effects.

In this study, we investigate a dimension of venture capital contracting not captured by the type of security used or other details in written contract documents – that of investment staging. As noted by Sahlman (1990), the staging of capital infusions is the most effective mechanism that venture capitalists can use to control the venture. If the legal environment affects a venture capitalist's ability to optimally stage investments, such a contracting friction could limit aggregate flows. To isolate the effects of this “staging channel” on aggregate flows, our approach holds home country and investor exposure constant by focusing on the cross-border investment patterns of U.S. venture capital firms.<sup>4</sup>

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<sup>3</sup> The contracts in their study come from VCs in more developed countries, and their sample appears to include more early stage rather than expansion or buyout deals.

<sup>4</sup> U.S. venture capital firms provided the majority of funding throughout our sample period, though our aggregate flow results hold if we expand the study to include investments from all sources.

We first examine what effect the legal environment has on aggregate annual investment amounts in a country. This analysis can naturally be considered in the context of La Porta et al. (1997), which examines the link between investor protection and capital market activity. They show that there are greater levels of *public* equity financing in common law countries (which offer better investor protection) than in civil law countries, and in countries that have higher rule of law and shareholders' rights scores. We might, for related reasons, expect similar cross-sectional findings for cross-border private equity investment. An alternative, though not necessarily mutually exclusive, possibility is that opportunities for U.S. private equity investment are greater in countries with weaker legal protection because of the tendency for these countries to have less developed capital markets. This may especially be the case for venture capital investing where funds and other value added services are bundled.<sup>5</sup> That is, countries with less developed capital markets are less likely to have developed venture capital talent (Bottazzi, Da Rin and Hellmann (2005)).<sup>6</sup>

We find evidence that aggregate cross-border venture capital flows are positively related to the quality of the overall legal environment, though they are not related to specific legal measures pertaining to the rights of public investors such as anti-director rights or one-share-one-vote provisions. Nor are they related to legal origin, suggesting that private investment can partially fill the financing gap. Yet, despite the fact that VCs are able to write their own contracts, they appear to be deterred from investing in countries with poor enforcement as measured by rule of law.

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<sup>5</sup> See, for example, Hellmann and Puri (2000, 2002), Lindsey (2005), or Sørensen (2006).

<sup>6</sup> More broadly, Levine (1997) suggests that countries with less well-developed capital markets are less likely to have developed financial intermediaries.

To provide evidence on the timing of capital infusions, we next examine investments at the company level. We find that U.S. venture capitalists make larger investments (in fewer rounds) in companies located in countries with worse legal protection. Both average round sizes and the fraction of financing raised in the first round are larger for companies in countries with poorer legal enforcement.<sup>7</sup> This evidence is consistent with the concentrated ownership predictions of LLSV (1998) and the third-best contracting hypothesis of Lerner and Schoar (2005), where venture capitalists must take a larger stake in the firm because courts may not be able to adequately enforce control rights with smaller ownership stakes.

The company level results suggest that there may be less than optimal staging in cross-border deals and that this friction could be a channel through which cross-border capital flows are constrained. To investigate this possibility, we develop a measure of contracting frictions by comparing the relative staging of cross-border deals to what one might consider optimal staging via propensity score matching methods, where each cross-border investment is matched to several U.S. peers. We aggregate this contracting friction measure by country-year and re-estimate our aggregate flow regressions. We find that the contracting friction measure is negatively related to aggregate flows, indicating that greater required initial ownership stakes limit cross-border venture capital flows.

The contribution of this paper is three-fold. First, the study contributes to the emerging literature on the determinants of cross-border investing. [See also Black and Gilson (1998), Jeng and Wells (2000), Kelley and Woidtke (2005), and Cumming,

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<sup>7</sup> These results could be considered surprising, in that one might think that countries with poor enforcement are also less developed, and therefore are likely to have smaller or riskier deals in which to invest.

Fleming, and Schwienbacher (2006).] Our results suggest that specialized investors are affected by different factors than those that affect the size of a country's capital market, and, therefore, can partially fill the financing gap in countries with less developed public markets.

Second, with respect to venture capital contracting, previous studies have focused on whether and how legal origins affect contract provisions. Using a broad sample of investment data, we test whether the legal environment affects the contracting *strategy* of U.S. venture capitalists: in particular whether U.S. venture capital firms mitigate contracting problems in countries with weak legal environments by taking greater equity stakes in these countries. Most closely related to our findings that round amounts are larger in countries with weaker legal environments, Lerner and Schoar find VC majority ownership at the minimum level specified by the contract to be more frequent and the difference between maximum and minimum contingency amounts to be smaller in civil law and lower dispute resolution ability countries. Our evidence, based on transaction amounts, also suggests that U.S. VCs turn to “third-best” contracting solutions in countries with weak legal environments.

Last, we link the suggestive evidence of “third-best” contracting back to aggregate flows by building a measure of contracting frictions. In the aggregate regressions conditional on investing, the legal environment variables no longer have explanatory power for aggregate cross-border flows after including this measure. We believe that this provides evidence of a “staging channel” through which frictions that lead to “third-best” contracting and sub-optimal staging of investment limit cross-border venture capital flows. The staging channel we identify complements the “contractual

channel” of Lerner and Schoar and controls for the sophisticated investor phenomenon of Kaplan, Martel, and Strömberg.

The remainder of the paper is organized as follows. In Section 2, we describe the data used in the study and present some descriptive statistics. In Section 3, we present our analysis of the relationship between a country's legal environment and the aggregate flows of U.S. Venture funds. In Section 4, we describe investment characteristics at the company level. Section 5 develops a measure of contracting friction and tests the hypothesis of “third-best” contracting as the channel through which legal rules affect aggregate flows. Section 6 concludes.

## **2. Data**

### *2.1. Cross-border investments by U.S. private equity funds*

Our data on cross-border investments are taken from Venture Economics obtained through Thomson Financial.<sup>8</sup> The Venture Economics database contains detailed financing information collected from participating venture capital firms and public sources. The data include the date of each financing round, the participating investors, the amount of funds raised, the portfolio company’s name, location, industry, and stage of development. For the period 1995 to 2004, the Venture Economics database contains a total of 5613 cross-border investments in 1813 companies (1602 of which have non-missing round amount information) made by 862 U.S. venture capital firms.<sup>9</sup> We

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<sup>8</sup> The Venture Economics database has been used in numerous studies, including Gompers (1995), Lerner (1995), Kaplan and Schoar (2005), and Gompers, Kovner, Lerner, and Scharfstein (2005). For further description of the data, see Kaplan, Sensoy, and Stromberg (2002).

<sup>9</sup> Investments abroad are sparse prior to 1995.



identify this sample by searching through all investments by U.S. private equity funds and excluding those where the country code is either missing or classifies the U.S. as the country of investment. We focus on venture deals only, excluding rounds where the stage of investment is coded as “Buyout” or “Special Situation”. We further searched the company websites of each private equity firm to determine whether the firm primarily engaged in buyouts and eliminated all deals in which these buyout investors participated.<sup>10</sup>

We construct two datasets: the *aggregate* dataset contains observations by country and year; the *company* dataset contains one observation per company. For the aggregate dataset, we calculate the total dollar value of venture investment (from U.S. venture capitalists) for each country in each year. We take the natural logarithm of one plus this amount for use as the dependent variable in the analysis. When a country does not receive U.S. venture funding in a given year, we treat it as a zero dollar investment amount for purposes of counting total flows.<sup>11</sup> For approximately 40% of the country-years we observe zero investment.

The first column of Table 1 shows investment amounts by country for the 1995 to 2004 period. The sample includes 57 countries in total<sup>12</sup>; though investment is somewhat concentrated. The UK receives the greatest proportion of cross-border investment (22%), followed by Canada (9%), China (6%), Germany (6%) and Japan (5%).

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<sup>10</sup> For example, there were instances where KKR was involved in deals coded as venture, where the deal was a well-publicized buyout. Because not all of these buyout transactions can be identified through public disclosures, we relied on the name of the participating firm to identify these possibly miscoded cases.

<sup>11</sup> Further, we can interpret countries that are in the World Bank data but not in our Venture Economics database as receiving zero investment in each year. We perform this analysis for robustness and find results to be similar.

<sup>12</sup> Botswana, Nigeria, Taiwan and Tunisia are excluded from the study because of missing World Bank data.

For the company dataset, we construct variables for the total dollar amount invested in each company and the average round amount, and again take natural logarithms to form the variables of interest. To examine the staging of deals, we construct a ratio for the fraction of total investment that the company received in its first round. We also count the number of rounds for all companies.

## *2.2. Legal environment and investor protection variables*

The legal environment and investor protection variables are from La Porta et al. (1998) and the World Bank. La Porta et al. (1998) categorize the legal environment by grouping countries according to their legal origins. The main categories are English common law and French, German and Scandinavian civil law traditions. The main difference in legal origin is the source and style of the law. Common law systems rely on judgments arising from specific situations while civil law systems rely on declarations of broad and general principles. Thus, civil law systems may be less flexible when new situations arise. In addition, our sample contains emerging economies from the socialist tradition. We define an indicator variable for countries from the common law legal tradition, and also perform robustness checks with the finer legal origin categories.

The rule of law index, from the World Bank, measures the quality of legal enforcement in a country and reflects the success of a society in developing an environment in which fair and predictable rules form the basis for economic and social interactions and the extent to which property rights are protected. The measure can range from  $-2.5$  to  $2.5$ , with lower values indicating less tradition for law and order.

We also consider investor protection variables from La Porta et al. (1998). The anti-director rights index aggregates six shareholder rights, with lower values indicating less protection.<sup>13</sup> One-share-one-vote is an indicator variable equaling one if the company law or commercial code of the country requires ordinary shares to carry one vote per share, and zero otherwise. We note that although these regulations may be important for public company investors, it is not clear that they are essential for venture capital investors. Venture capital investors have more direct monitoring and contracting authority and are not necessarily required to exit, in the case of a public offering, on the public exchange in the home country. Still, these rights do contribute to the overall quality of investor protection in a country. The values for the legal environment and investor protection variables are displayed for each country in Table 1.

### *2.3. Investment opportunities, firm characteristics, and other controls*

We use several measures to control for investment opportunities across countries. The size and development of the financial markets are captured using the ratio of market capitalization of listed companies to GDP. We also control for annual GDP growth. Both of these measures are from the World Bank.

At the company level, we define a variable to indicate the stage of development at the time of venture funding. We set the early stage indicator variable equal to 1 if the company received seed or early stage financing in its first round, 0 otherwise. We control

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<sup>13</sup> The six shareholder rights are: 1) the country allows shareholders to mail their proxy votes; 2) shareholders are not required to deposit their shares prior to the general shareholders' meeting; 3) cumulative voting or proportional representation of minorities on the board of directors is allowed; 4) an oppressed minorities mechanism is in place; 5) the minimum percentage of share capital that entitles a shareholder to call for an extraordinary shareholders' meeting is less than or equal to 10 percent (the sample median); and 6) shareholders have preemptive rights that can be waived only by a shareholders' vote.

for the company's industry using indicator variables defined according to the Venture Economics industry classification system. We also define an indicator variable for whether the company went public after the investment. Although this variable is forward-looking, and undoubtedly measures *ex ante* perceived outcomes with noise, it reflects the many unobservable factors that would indicate company prospects at the time of funding.

Another way to control for company prospects is to control for the quality of venture capitalists involved in the funding. Because sorting is known to occur in the venture capital market, whereby better quality VC firms have access to better quality companies, we construct a variety of venture capitalist measures to control for overall quality and the reputation of the venture capital firm (Sørensen (2005)). Following Hochberg, Ljungqvist, and Lu (2005), we calculate various measures of VC experience using data from 1980 to the year of the first round of investment for the company. We average these measures across VCs for each company.

We define VC age as the average number of years, since 1980, that the company's VCs have been in the Venture Economics Database. We also control for average fund size, since more successful VC firms are able to raise larger funds, and also because larger funds may be more willing to take on larger investments (Gompers and Lerner (2000)). We take the natural logarithm of one plus each of these three variables for use as controls. In addition, we control for VC experience in doing foreign deals by defining proportion abroad as the number of cross-border investments as a percentage of all investments. Finally, we define indicator variables for each year in the sample.

Table 2 Panel A presents summary statistics for the aggregate sample, and Panel B presents summary statistics for the company sample.

### **3. Aggregate Flows as a function of the Legal Environment**

In this section we examine how the legal environment affects aggregate cross-border private equity investment by U.S. venture capital firms. The analysis builds on the law and finance literature that examines the impact of laws and legal institutions on financial decision-making and economic development. We ask whether private equity investors, given that they may be affected by different factors than traditional investors, are able to allocate capital where investor protection for other types of investors is lacking.

The dependent variable in this analysis is the natural logarithm of (one plus) the total aggregate cross-border investment amount by U.S. venture capital firms in a given country in a given year, i.e., our unit of observation is a country-year. Our data are censored in that we only observe positive investment amounts for a given year; if there are no flows, we observe a zero. Thus, the Tobit model is most appropriate for examining total flows. We use a random-effects specification, which has the advantage of allowing for time-varying effects across countries.<sup>14</sup>

Table 3 shows the regression results for five specifications. The variables of interest are the legal environment variables: the common law indicator variable, the rule of law index, the anti-directors rights index, and the one-share-one-vote indicator

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<sup>14</sup> Country fixed effects cannot be used because there is no within-country variation in the legal country-level variables, and the conditional likelihood for a Tobit with fixed effects is not defined.

variable. Controls for the country's financial development and growth include the ratio of public market capitalization to GDP, GDP growth, and annual indicator variables. Column 1 reports results for the specification that focuses on the effect of legal origin on cross-border flows. The coefficient on the common law indicator variable is not statistically different from zero. This finding is in sharp contrast with La Porta et al. who find that the common law legal origin is significantly positively correlated with the availability of external financing in a country. The difference in findings suggests that, unlike for other types of investors, investment amounts by cross-border venture investors are not affected by the set of factors associated with legal origin. This may, in part, be due to the contracting sophistication of U.S. venture capitalists. While legal origin may be linked with public market investor protections and affect the size of public equity markets, public investor protections are less relevant for private equity investors. This result suggests that private equity can aid capital formation in countries that traditionally have weaker investor protections and smaller public markets.

Columns 2 and 5 report evidence on the relation between rule of law and total investment, both with and without the additional controls for public market investor protection. The estimates indicate that U.S. venture capital firms invest more in countries with better rule of law measures, which may be related to legal enforcement of their contracts. The coefficients on the rule of law measure are positive and statistically significant in both specifications. The findings are also economically significant. A coefficient on the rule of law of 1.8 implies that a one standard deviation increase in the rule of law index from the sample median of .97 to 1.75 increases cross-border venture capital investment by 140% percent. This corresponds roughly to a move from a legal

system comparable to Italy's to that of Ireland. This finding implies that a country's rule of law is an important determinant of U.S. cross-border investment and that U.S. venture capital firms may be deterred from investing in countries where the rule of law is weak.

Finally, we note that the public market protection variables, anti-director rights and one-share-one-vote, do not affect venture capital flows in the same ways as they have been shown to affect public market development, either when considered separately in columns 2 and 3 or when added to the specification with the rule of law variable in column 5. As with the common law measure, these results suggest that private equity investors are not affected by the traditional factors shown to be relevant to public equity markets. With respect to the control variables, we find that the market size coefficient is positive and statistically significant, while the measure for GDP growth is not measurably different from zero. These findings are consistent with the argument made in Rajan and Zingales (2003) that the ratio of market capitalization to GDP serves as a proxy for openness in an economy to foreign activities.

In summary, we find that legal origin and the protection provided to shareholders of public companies (i.e., anti-directors rights and one-share-one-vote) are not measurably related to venture capital investment amounts. The latter findings are consistent with Bergman and Nicolaievsky (2004) who find that the level of investor protection does not matter for private companies since they can enhance protection through private contracts.<sup>15</sup> The implication for venture capitalists filling the financing gap stands in contrast to Kelley and Woidtke (2005), who find that U.S. multinationals

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<sup>15</sup> Bergman and Nicolaievsky (2004) analyze the decision by a firm to provide protection to its investors. Private firms have lower renegotiation costs than public firms and tend to enhance the investor protection provided by the law but public firms do not.

invest more in countries with low anti-director rights.<sup>16</sup> Our findings indicate that U.S. venture capital firms do not invest more in countries with weaker public investor protection. These results do suggest, however, that private equity funds can protect themselves when investor protection rules are weak as long as contracts can be enforced.

#### **4. Investment Characteristics at the Company Level**

In this section, we examine patterns of investing at the company level. A large literature considers how financial contracts can be used to align incentives and to mitigate agency problems between entrepreneurs and investors. If contracts are costly to enforce or to verify, the most efficient (“first-best”) outcome is not achievable; instead, “second-best” outcomes can be achieved by allocating ownership and control rights appropriately (Hart (2001)). Kaplan and Strömberg (2003, 2004) show that contracts in the venture capital setting allocate cash flow and control rights separately, sharing many features of what contracting theory would predict as the optimal achievable (“second-best”) contract. For example, convertible preferred securities and milestone provisions shift cash flow and control rights between the investor and entrepreneur depending on the portfolio company’s performance, enabling a dynamic allocation of these rights though time. Such contracts, however, may be difficult to enforce in legal systems where the concept of a minority cash flow claimant having the power to force the sale of a company or to remove the founder, who may have a larger ownership share, is unfamiliar. If investors

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<sup>16</sup> Kelley and Woitke (2005) use the rule of law index as a descriptor of the general business environment in a country and also find a positive relation between U.S. multinational investments and the rule of law index. In their paper, they concentrate the discussion on the relation between investor protection (anti-directors rights) and investments by U.S. multinational firms.



are aware of the difficulty of enforcement in countries with less sophisticated legal systems, they may adjust the pattern of fund disbursements to the entrepreneurial firm. In particular, they may increase their initial stake of ownership in the firm beyond what the optimal second-best contract would dictate had the deal taken place in a country where more sophisticated contracts are reliably enforced.

Lerner and Schoar (2005) suggest the idea of “third-best” contracting in the cross-border venture capital setting in a slightly different form. Studying a sample of contracts, they find that contracts written in common law countries are similar to those written in the U.S., where convertible preferred stock is often used. In contrast, in civil law countries and countries with poor legal environments, VCs take greater equity ownership stakes by using common stock and debt. A second study examining cross-border contracting documents reaches a different conclusion. Kaplan, Martel and Strömberg (2004) find that VC sophistication, measured by the age and size of the VC, as well as exposure to U.S. venture capitalists can explain observed differences in contracts across countries. They argue for contract convergence, where exposure to U.S.-style contracting increases its use abroad. It is important to note that even if there is convergence in the written contracts, venture capital investors may stage the funding of deals differently depending on the anticipated enforceability of these complex contracts.

Though we do not directly observe contracts or the fractional ownership of the venture capitalist, we make inferences about reliance on third-best contracting in weak legal environments by examining round size characteristics. Because valuations are generally higher in better legal environments (Lerner and Schoar (2005)), a larger investment amount would reflect a larger ownership stake in the company for countries

with lower legal environment measures. In addition, John and Kedia (2006) provide theoretical arguments in support of the notion that large investments in companies in weak legal environment countries would reflect larger percentage ownership, i.e., their results suggest that the efficient scale of firms is smaller in countries with weaker legal environments. Alternatively, if we expect no adjustments in the staging of disbursements for anticipated enforceability, then, as in Kaplan et al. (2006), the equity stake will not depend on the quality of the legal environment, so we would not expect a relation between round sizes and the legal environment after controlling for the sophistication of the VC firm and firm characteristics.

We use two approaches to better understand the degree of staging and size of ownership stakes. First, we examine the average round investment amounts for each company. Second, we measure the fraction of venture funds received in the company's first round. Because venture capital firms stage their investments for a variety of reasons, average round size may be affected by factors in addition to reduced staging in anticipation of weak enforceability. Gompers (1995) describes staging as a tool used in order to gather information, monitor the company, and maintain the option of abandoning the company. Therefore, a company with less risk along these dimensions would require less staging, all else equal. Further, average round sizes could be driven higher by increasing funding needs as companies mature coupled with slower development (later exit), regardless of legal differences across countries. In unreported regressions, we find no statistical evidence that the legal environment measures in a country explain total funds raised at the company level. Nevertheless, examining first rounds as a fraction of total of funds raised eliminates the later concern. Normalizing by the total funds raised

(and controlling for exit) has the additional benefit of controlling for the amount of venture financing needed for exit that may vary by unobservable attributes of the deal, such as risk. A worry would be if ownership stakes were smaller or the same size, but failure occurred earlier, such that the fraction in the first round is higher even if third best contracting is not really observed. It cannot simultaneously be true that first round fractions and average round sizes are higher in poor legal protection countries without this also representing more ownership as long as valuations are higher in better legal environment countries.

Table 4 presents the results of random-effects generalized least squares estimations for the effects of legal environment on (the natural logarithm of) average round amount. Columns 1 and 2 show the results for the specification with the common law legal origin indicator. These specifications include the market capitalization to GDP ratio and GDP growth as in the aggregate regressions. We also control for company-specific factors such as the stage at the time of the initial funding round, total funds raised, and industry and year controls, as well as VC-specific factors averaged over the funding venture capitalists including average firm age, average fund size, and average experience investing outside the United States. In Column 2, the specification adds the forward-looking IPO variable to control for eventual exit and underlying company quality. The legal origin variable is not statistically significant in either specification. Columns 3 and 4 present the rule of law specifications, one with each set of controls. We find that countries with weaker legal enforcement have larger average round amounts. Columns 5 and 6 also present specifications with the rule of law measure with the addition of the public investor protection variables. Again, companies in weaker rule of

law countries are associated with larger round amounts. The public investor protection variables observe no relation to average round sizes. Control variables have intuitive signs, with higher GDP growth associated with larger average round sizes, consistent with higher valuations and perhaps lower risk. Companies first funded at an early stage have lower round sizes on average, and, companies raising a larger total amount have higher round sizes. The venture capital controls indicate that companies receiving funding from larger VC funds tend to have larger rounds. Companies receiving funding from older VCs and VCs with a greater proportion of investments abroad, however, have lower average round sizes. This relation could reflect a preference for more staged investments among more experienced VCs or reflect a riskier company profile.

Table 5 presents the same set of specifications as in Table 4, but with the dependent variable as fraction of funds the company raised in the first round.<sup>17</sup> Results are largely consistent with those of the average round specification. The legal origin variable is not associated with the first round fraction (Columns 1 and 2). The coefficient on the rule of law measure is negative in the remaining specifications, indicating larger investment amounts in the first round relative to total funding needs for countries with lower measures for rule of law. The signs on the control variables are similar to the average round specifications, with the exception of total funds raised, which is negatively correlated with the proportion of funding a company receives in its first round. Also, while the coefficient on the IPO variable was not significant in the average round specification, it is positive and statistically significant in the specification for the fraction

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<sup>17</sup> Though the dependent variable is a ratio, because a non-negligible number of observations are equal to 100%, we do not perform the logit transform, which would result in division by 0 for these observations.

of funds in the first round. This could proxy for company quality or indicate that failed firms continue to receive funding as their eventual outcome is realized.

We have shown that average round sizes and first round fraction sizes are larger for countries with lower legal protection. These results are consistent with venture capitalists taking a larger share of ownership in countries with weaker legal protection. Taken together, this evidence is suggestive that in countries with lower rule of law, optimal contracting at second best may not be enforceable. Companies with similar characteristics are financed more aggressively in countries with lower legal enforcement. In countries with poor legal environments, VC investors may mitigate enforcement problems using a “third-best” solution, where the investor must purchase cash flow rights commensurate with the level of control required. A third-best contracting outcome would reduce the incentives of entrepreneurs, who give up a substantial amount of cash-flow control, and constrain the strategy of venture capital firms who may then have to devote too much equity to a single deal. As a consequence, fewer companies will be desirable investment prospects and, thus, are not funded at all. In countries where this problem is more severe, aggregate flows will decline.

## **5. Contracting Frictions and Aggregate Flows**

To test the idea that contracting frictions limit aggregate flows to countries with weaker rule of law, we develop a measure of contracting friction based on the fraction of total investment a company received in its first round. The rationale is that if courts have difficulty in interpreting the separation of cash flow and control rights present in the venture capital setting, venture capitalists will have to take a larger stake in the firm

initially, so that the level of ownership is commensurate with the level of control in the eyes of a less sophisticated legal system. Because of this constraint on the implementation of the second-best, flows to the country will be limited. If our contracting friction measure has explanatory power in the aggregate capital flow regressions (relative to rule of law), it would be convincing evidence that contracting efficiency is the channel through which a poor legal environment restricts capital flows, despite evidence that written contracts may be observationally equivalent.

To develop our measure of contracting friction, we employ propensity score matching methods to compare a company's staging characteristics in its actual country of origin with closely matched companies that were funded in the United States. For each company, we will compute the difference between its fraction of financing received in the first round relative to its U.S. peers. We focus on the fraction of funds received in the first financing round measure because larger average round sizes without controlling for legal system differences could reflect greater funding needs or higher valuations on average. The first round fraction measure has the nice feature of normalizing each company's staging by the company itself. By using the propensity score, we can effectively take into account the fact that the characteristics of venture deals across various legal regimes may differ significantly from one another and from venture deals in the U.S., ensuring that differences in such observed characteristics are not driving the results.

We use econometric matching methods developed by Rosenbaum and Rubin (1983), Heckman and Robb (1986), and Heckman, Ichimura, and Todd (1997, 1998). In essence, matching methods use the company characteristics to construct an optimal control

sample. For each of the cross-border and U.S. deals, we compute a propensity score via a Probit model, where the dependent variable is an indicator for a non-U.S. deal. The independent variables include the company and venture capital controls from the previous section: the early stage indicator, total funds raised, the IPO indicator, industry and first-funding year controls, the average age of the funding VCs, the average size of the funding VCs, and the average VC experience abroad. We use nearest neighbor matching, one of several standard approaches for calculating propensity scores. For each cross-border portfolio company, the nearest neighbor matching estimator chooses the  $n$  U.S. companies with closest propensity scores to the cross-border company propensity score. The estimator computes the arithmetic average of the first round fractions of these  $n$  U.S. deals. For each  $Y_{li}$ , we match  $\bar{Y}_{0i}^{NN} = \frac{1}{n} \sum_{j \in N(i)} Y_{0j}$  where  $N(i)$  is the set of U.S. companies that are nearest neighbors to  $Y_{li}$ .<sup>18</sup> For our reported results, we set  $n = 5$ , though results are robust to one-to-one matching and other values of  $n$  as well.

For each cross-border portfolio company, we compute the difference between its first round fraction of funding and the (weighted) average first round fraction of its U.S.-based peers, matched on company and venture capitalist characteristics.<sup>19</sup> Table 6 reports summary statistics from the matching as well as a comparison of probits on the matched versus unmatched samples. Before matching, the average U.S. company received 46% of its financing in the first round, whereas the average cross-border company received

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<sup>18</sup> Using observations that fall outside of the common support can substantially bias the results (see, e.g., Heckman, Ichimura, and Todd (1997)). As a result, we remove all companies that are outside of the common propensity score support.

<sup>19</sup> Formally, let  $Y_{li}$  be the fraction of funds received in the first round for a non-U.S. company,  $Y_{0j}$  be the fraction of funds received in the first round for a U.S. company, and let  $\bar{Y}_{0i}^z$  represent the (weighted) average of the fraction of funds received in the first round for a U.S. company using estimator  $z$ , that is matched with  $Y_{li}$ . We compute for every  $i$  the estimated first round fraction difference  $Y_{li} - \bar{Y}_{0i}^z$ .

almost 59% of its financing in the first round. However, much of this difference might be explained by observable characteristics. Indeed, from the first column reporting probit estimates from the full (pre-match) sample, we see that U.S. venture capital investments more often take place in earlier stage companies, raise more funds, and have lower IPO rates. The funding VCs, on average, invest a lower proportion of funds abroad than do VCs funding the non-U.S. sample, and are smaller and younger. These observable characteristics have considerable explanatory power in predicting foreign deals, with a pseudo R-squared of approximately 46%. When we repeat the probit on the post-matched sample, we see that these observable characteristics no longer explain differences in U.S. and foreign deals. The only coefficient that is statistically significant in the multiple regression setting (on its own, the means between the two samples are indistinguishable by design from the procedure) is the coefficient on the funding venture capitalists' average fund size, which indicates that in the post-match sample, foreign deals are associated with smaller VCs on average. The pseudo R-squared of the regression is 1.9%, indicating that observable characteristics are substantially similar for both the cross-border firms and their matched peers. The average fraction of financing received in the first round by U.S. peer firms increases to 52.1% in the post-matched sample, indicating that just under half of the measured difference in first round fractions pre-match was due to observable company and venture capitalist characteristics.

We can now use the first round fraction difference between a company and its U.S. peer companies to build a measure of contracting frictions for our aggregate sample. For each country-year, we simply compute the average first round fraction difference. A shortcoming of our contracting friction measure is that it is observable conditional on



investment. Therefore, we will not be able to explain the decision to invest or not. The contracting friction might be so large that investment does not take place or investment may not take place for other reasons. The tests relating contracting frictions to cross border venture capital flows are conditional on there having been a flow.

In Table 7, we return to the aggregate sample examined in Section 3 with the addition of an independent measure of contracting frictions. Table 7 presents random-effects GLS estimations as in Section 4. In all of the specifications, the coefficient on the contracting friction measure is negative and statistically significant. In other words, the more investments abroad are front-loaded with a larger fraction of funds in the first round beyond what is explained by observable investment characteristics, the lower the capital flow. In these specifications, none of the country-specific legal variables have explanatory power distinguishable from zero, individually or together. Overall, we see that the contracting friction measure is consistently negatively related to venture capital flows.

We show that the legal environment is related to the way funds are disbursed to firms. Average round sizes are larger in companies based in countries with a lower rule of law measure, after controlling for characteristics such as stage of development, industry, and the total amount of financing received. Further, the fraction of total funding a firm receives in its first round of financing is higher in counties with lower rule of law as well.

## **6. Conclusion**

In this paper, we examine the effect of home country legal environment on the extent and nature of cross-border investment by U.S. venture capital firms. Our findings suggest that the inability to interpret complex contracting relationships, such as the separation of cash flow and control rights, hinders optimal private equity investing abroad, and that this hindrance has implications for private equity flows.

Our evidence on aggregate cross-border investment flows suggests that although VCs are able to write their own contracts, poor enforcement deters investment. Consistent with third-best contracting as described in Lerner and Schoar (2005), we find that U.S. venture capitalists disburse larger investment amounts in companies in countries with worse legal protection. This finding suggests U.S. venture capital firms mitigate contracting problems in countries with weak legal environments by taking greater equity stakes in these countries. By examining the extent to which these larger investments relate to aggregate flows, we provide a test of whether contracting frictions are the likely channel through which poor rule of law limit venture capital investment abroad.

Our study contributes to the emerging literature on the determinants of cross-border investing. Our results suggest that specialized investors are affected by different factors than those that affect the size of a country's capital market, and, therefore, can partially fill the financing gap in countries with less developed public markets. Though affected by different legal factors, the limiting channel for development is quite similar. A weaker legal environment, even in the context of private equity investors, leads to increased ownership concentration, limiting the size of the market just as in the public equity case.

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Table 1  
Summary of Investment and Legal Environment Measures by Country

Country	Investment (\$1000s) 1995-2004	Legal Origin	Rule of Law	Anti-Director Rights	One Share One Vote
Algeria	405	French	-.6675	N/A	N/A
Argentina	55886	French	-.01	4	0
Australia	24525	British	1.9075	4	0
Austria	7963	German	1.9975	2	0
Belgium	29408	French	1.4875	0	0
Brazil	99658	French	-.195	3	1
Bulgaria	350	Socialist	-.0925	N/A	N/A
Canada	254076	British	1.8875	5	0
Chile	9060	French	1.27	5	1
China	173319	Socialist	-.2975	N/A	N/A
Colombia	11703	French	-.625	3	0
Costa Rica	350	French	.7375	N/A	N/A
Croatia	695	Socialist	-.07	N/A	N/A
Cyprus	4500	British	.825	N/A	N/A
Czech Republic	10475	Socialist	.6425	N/A	N/A
Denmark	24223	Scandinavian	1.9625	2	0
Ecuador	2780	French	-.5725	2	0
Estonia	5400	Socialist	.6	N/A	N/A
Finland	7530	Scandinavian	2.0375	3	0
France	128676	French	1.455	3	0
Germany	167494	German	1.8325	1	0
Hong Kong (China)	84920	British	1.5775	5	0
Hungary	11693	Socialist	.7875	N/A	N/A
Iceland	1495	Scandinavian	1.8975	N/A	N/A
India	110468	British	.125	5	0
Indonesia	3437	French	-.7525	2	0
Ireland	46970	British	1.765	4	0

Israel	109703	British	1.065	3	0
Italy	30985	French	.9175	1	0
Japan	143849	German	1.615	4	1
Jordan	300	French	.4225	1	1
Korea	138826	German	.78	2	1
Luxembourg	70832	French	1.925	N/A	N/A
Malaysia	7825	British	.6875	4	1
Mexico	27620	French	-.27	1	0
Morocco	1100	French	.29	N/A	N/A
Netherlands	95336	French	1.915	2	0
New Zealand	699	British	2.01	4	0
Norway	6804	Scandinavian	2.0425	4	0
Peru	1030	French	-.4325	3	1
Philippines	3136	French	-.2875	3	0
Poland	13409	Socialist	.575	N/A	N/A
Portugal	2140	French	1.2625	3	0
Romania	6450	Socialist	-.2125	N/A	N/A
Russia	5428	Socialist	-.805	N/A	N/A
Singapore	29519	British	2.03	4	1
Slovak Republic	712	Socialist	.24	N/A	N/A
South Africa	2335	British	.26	5	0
Spain	19993	French	1.26	4	0
Sweden	35490	Scandinavian	1.9425	3	0
Switzerland	47995	German	2.165	2	0
Thailand	9358	British	.3975	2	0
Turkey	2712	French	.07	2	0
United Arab Emirates	667	British	1.0975	N/A	N/A
United Kingdom	594581	British	1.9075	5	0
Venezuela	5230	French	-.7725	1	0
Vietnam	300	Socialist	-.6025	N/A	N/A

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Table 2 Panel A  
Descriptive Statistics  
Aggregate Data

Variable	Number of Observations	Mean Total Sample	Standard Deviation	Minimum	Maximum
LN (TOTAL FLOW)	570	5.720	5.079	0	14.717
RULE OF LAW	570	0.789	0.951	-0.805	2.165
ANTI-DIRECTOR RIGHTS	390	2.974	1.351	0	5
ONE SHARE ONE VOTE	390	0.205	0.404	0	1
MARKET CAP/ GDP	568	0.620	0.666	0.0002	5.2822
GDP GROWTH	568	3.560	3.376	-13.127	17.327

Table 2 Panel B  
Descriptive Statistics  
Company Data

Variable	Number of Observations	Mean Total Sample	Standard Deviation	Minimum	Maximum
AVERAGE ROUND AMT (\$1000s)	1602	12181.68	25965.82	1.6	383020
NUMBER OF ROUNDS	1813	1.941	1.485	1	16
RULE OF LAW	1808	1.282	0.803	-0.805	2.165
ANTI-DIRECTOR RIGHTS	1622	3.595	1.403	0	5
ONE SHARE ONE VOTE	1622	0.171	0.377	0	1
MARKET CAP/ GDP	1810	0.974	0.711	0.009	4.613
GDP GROWTH	1813	3.777	2.663	-10.894	11.282
EARLY STAGE	1813	0.456	0.498	0	1
LN FUNDS RAISED					
IPO	1813	0.109	0.311	0	1
LN AVERAGE VC AGE	1813	2.051	0.637	0.288	3.258
LN AVG VC FUND SIZE	1800	2.524	0.130	1.724	2.822
VC PROPORTION ABROAD	1813	0.383	0.283	0.007	1

**Table 3**  
**Random Effects Tobit Estimation of Venture Capital Investment Amount**  
**Aggregate Data**

<b>Dependent Variable:</b>					
LN(TOTAL FLOW)					
	1	2	3	4	5
COMMON LAW	1.160 (0.56)				
RULE OF LAW		1.796 ** (2.12)			1.839 *** (3.43)
ANTI-DIRECTOR RIGHTS			-0.178 (-0.63)		0.250 (0.66)
ONE SHARE ONE VOTE				0.618 (0.42)	-0.706 (-0.52)
MARKET CAP/ GDP	2.464 *** (3.08)	2.025 *** (2.93)	2.541 *** (5.37)	2.464 *** (5.27)	1.459 *** (2.94)
GDP GROWTH	-0.049 (-0.52)	-0.048 (-0.58)	-0.058 (0.65)	-0.071 (-0.76)	-0.063 (-0.73)
Intercept	3.754 *** (2.88)	2.771 ** (2.27)	4.420 *** (3.90)	2.849 *** (2.72)	2.752 ** (1.97)
Year Controls Included but not Reported					
Sigma u	4.553 *** (7.66)	4.277 *** (9.77)	4.380 *** (9.60)	4.384 *** (8.46)	3.833 *** (6.47)
Sigma e	4.955 *** (22.2)	4.964 *** (22.3)	4.291 *** (20.5)	4.297 *** (20.5)	4.328 *** (20.4)
Rho	0.4577 ***	0.426 ***	0.510 ***	0.510 ***	0.440 ***
Standard Error	0.0674	0.051	0.056	0.063	0.080
Number of observations	538	538	390	390	390
	Wald chi2(12)=110.16 Prob > chi2 = 0.00	Wald chi2(12)=117.70 Prob > chi2 = 0.00	Wald chi2(12)=109.21 Prob > chi2 = 0.00	Wald chi2(12)=105.59 Prob > chi2 = 0.00	Wald chi2(14)=109.13 Prob > chi2 = 0.00

\*, \*\* or \*\*\* mean the coefficient is significant at 10%, 5% or 1% level respectively



**Table 4**  
**Generalized Least Squares Estimation of Average Round Size with Random Country Effects**  
**Company Data**

<b>Dependent Variable:</b> LN(AVERAGE ROUND SIZE)	1	2	3	4	5	6
COMMON LAW	-0.001 (-0.02)	0.001 (0.02)				
RULE OF LAW			-0.180 *** (-3.30)	-0.078 *** (-3.26)	-0.105 *** (-3.81)	-0.104 *** (-3.76)
ANTI-DIRECTOR					-0.004 (-0.34)	-0.004 (-0.32)
ONE SHARE / VOTE					0.071 (1.64)	0.070 (1.62)
MARKET CAP/ GDP	-0.042 * (1.91)	-0.043 * (1.92)	0.003 (0.10)	0.002 (0.09)	0.009 (0.35)	0.008 (0.32)
GDP GROWTH	0.028 *** (5.08)	0.028 *** (5.05)	0.019 *** (3.06)	0.019 *** (3.06)	0.022 *** (3.15)	0.022 *** (3.15)
EARLY STAGE	-0.230 *** (-7.99)	-0.229 *** (-7.93)	-0.228 *** (-7.95)	-0.227 *** (-7.91)	-0.226 *** (-7.44)	-0.225 *** (-7.38)
FUNDS RAISED	0.823 *** (85.63)	0.822 *** (84.29)	0.821 *** (85.79)	0.820 *** (84.56)	0.818 *** (78.66)	0.818 *** (77.85)
IPO		-0.030 (0.64)		0.019 (0.42)		0.030 (0.60)
PROP. ABROAD	-0.132 ** (-2.14)	-0.132 ** (-2.14)	-0.135 ** (-2.25)	-0.135 ** (-2.26)	-0.167 ** (-2.56)	-0.168 *** (-2.57)
AVG AGE	-0.223 *** (-7.56)	-0.222 *** (-7.51)	-0.222 *** (-7.58)	-0.221 *** (-7.55)	-0.232 *** (-7.55)	-0.232 *** (-7.50)
AVG FUND SIZE	0.763 *** (5.18)	0.763 *** (5.18)	0.748 *** (5.11)	0.747 *** (5.10)	0.723 *** (4.38)	0.721 *** (4.36)
Intercept	-0.610 * (-1.72)	-0.488 (-1.38)	-0.391 (-1.10)	-0.462 (-1.31)	0.386 (0.98)	0.335 (0.84)
Industry and Year Controls Included but not Reported						
Number of observations	1220	1220	1220	1220	1110	1110
	Wald(26)=	Wald(27)=	Wald(26)=	Wald(27)=	Wald(28)=	Wald(29)=
	11602.67	11597.36	11719.33	11711.41	10496.74	10490.95
Prob > chi2	0.00	0.00	0.00	0.00	0.00	0.00

\*, \*\* or \*\*\* mean the coefficient is significant at 10%, 5% or 1% level respectively

**Table 5**  
**Generalized Least Squares Estimation of Fraction First Round Size with Random Country Effects**  
**Company Data**

<b>Dependent Variable:</b> FRACTION FIRST	1	2	3	4	5	6
COMMON LAW	-0.006 (-0.32)	-0.004 (-0.18)				
RULE OF LAW			-0.131 ** (-2.06)	-0.029 * (-1.92)	-0.045 *** (-2.63)	-0.042 ** (-2.46)
ANTI-DIRECTOR					-0.006 (-0.87)	-0.006 (-0.78)
ONE SHARE / VOTE					0.020 (0.73)	0.017 (0.64)
MARKET CAP/ GDP	0.005 (0.39)	0.005 (0.36)	0.021 (1.39)	0.020 (1.33)	0.027 * (1.65)	0.025 (1.54)
GDP GROWTH	0.013 *** (3.80)	0.013 *** (3.72)	0.009 ** (2.44)	0.009 ** (2.45)	0.013 *** (2.97)	0.013 *** (2.98)
EARLY STAGE	-0.150 *** (-8.37)	-0.147 *** (-8.21)	-0.149 *** (-8.33)	-0.147 *** (-8.19)	-0.149 *** (-7.91)	-0.146 *** (-7.72)
FUNDS RAISED	-0.100 *** (16.63)	-0.102 *** (-16.97)	-0.100 *** (-16.77)	-0.102 *** (-16.91)	-0.103 *** (-15.98)	-0.106 *** (-16.22)
IPO		0.063 ** (2.21)		0.060 ** (2.09)		0.078 ** (2.53)
PROP ABROAD	-0.078 ** (-2.02)	-0.078 ** (-2.02)	-0.076 ** (-2.03)	-0.077 ** (-2.06)	-0.070 * (-1.72)	-0.071 * (-1.76)
AVG AGE	-0.096 *** (-5.20)	-0.093 *** (-5.08)	-0.095 *** (-5.18)	-0.093 *** (-5.07)	-0.097 *** (-5.04)	-0.094 *** (-4.90)
AVG FUND SIZE	0.428 *** (4.66)	0.426 *** (4.65)	0.424 *** (4.63)	0.422 *** (4.62)	0.419 *** (4.08)	0.414 *** (4.04)
Intercept	0.437 * (1.98)	0.684 *** (3.09)	0.791 *** (3.59)	0.790 *** (3.59)	1.174 *** (4.77)	0.554 ** (2.23)
Industry and Year Controls Included but not Reported						
Number of observations	1220	1220	1220	1220	1110	1110
Prob > chi2	Wald(26)= 712.97 0.00	Wald(27)= 720.15 0.00	Wald(26)= 719.61 0.00	Wald(27)= 725.99 0.00	Wald(28)= 688.23 0.00	Wald(29)= 698.10 0.00

\*, \*\* or \*\*\* mean the coefficient is significant at 10%, 5% or 1% level respectively

**Table 6**  
**Propensity Score Matching Probit Regressions**

<b>Dependent Variable:</b>		
Non-U.S. Investment	Pre-match	Post-match
EARLY STAGE	-0.308 *** (-8.74)	-0.006 (-0.19)
FUNDS RAISED	-0.087 *** (-7.16)	0.011 (1.12)
IPO	0.351 *** (5.88)	-0.038 (-0.86)
PROPORTION ABROAD	5.744 *** (53.99)	0.064 (1.09)
AVG AGE	0.019 *** (5.52)	-0.001 (-0.29)
AVG FUND SIZE	0.114 *** (7.94)	-0.087 *** (-7.26)
Intercept	-2.395 *** (-13.37)	-0.006 (-0.19)
Year and Industry Controls Included but not Reported		
Number of observations	16,337	12,445
	Pseudo R2 = .459	Pseudo R2 = .019
	Prob > chi2 = 0.00	Prob > chi2 = 0.00
Mean Fraction First Non-U.S. Deals	0.588	0.583
Mean Fraction First U.S. Deals	0.460	0.521
Number of Treatment (Non-U.S.)	2100	2069

\*, \*\* or \*\*\* mean the coefficient is significant at 10%, 5% or 1% level respectively

**Table 7**  
**Generalized Least Squares Estimation of Venture Capital Investment Amount with Random Country Effects**  
**Aggregate Data with Contracting Friction Measure**

<b>Dependent Variable:</b>					
LN(TOTAL FLOW)					
	1	2	3	4	5
CONTRACT FRICTION	-0.588 ** (-2.55)	-0.548 ** (-2.37)	-0.592 ** (-2.31)	-0.584 ** (2.28)	-0.567 ** (-2.94)
COMMON LAW	0.402 (0.86)				
RULE OF LAW		0.239 (1.09)			0.172 (0.66)
ANTI-DIRECTOR RIGHTS			0.098 (0.58)		0.079 (0.44)
ONE SHARE ONE VOTE				0.023 (0.04)	0.031 (0.05)
MARKET CAP/ GDP	0.203 (1.03)	0.175 (0.87)	0.163 (0.82)	0.187 (0.95)	0.136 (0.66)
GDP GROWTH	0.060 ** (2.24)	0.061 ** (2.29)	0.058 ** (2.11)	0.059 ** (2.16)	0.059 ** (2.14)
Intercept	9.325 *** (26.22)	9.220 *** (24.24)	9.388 *** (15.78)	8.078 *** (21.07)	7.693 *** (11.91)
Year Controls Included but not Reported					
Number of observations	287	287	242	242	242
	Wald chi2(13)=131.51 Prob > chi2 = 0.00	Wald chi2(13)=131.99 Prob > chi2 = 0.00	Wald chi2(13)=132.33 Prob > chi2 = 0.00	Wald chi2(13)=132.13 Prob > chi2 = 0.00	Wald chi2(15)=133.48 Prob > chi2 = 0.00

\*, \*\* or \*\*\* mean the coefficient is significant at 10%, 5% or 1% level respectively