ESSAYS ON THE POLITICAL ECONOMY OF INSTITUTIONS

by

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ABSTRACT
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There is a consensus among economists and political scientists that institutions are crucial for economic development. Different attributes of institutions like rule of law, property rights, legal environment, and constraints on executive have profound effects on a nation's prosperity, growth and development. Recently economists have recognized that a system of strong institutions of property rights can enhance efficiency of financial sector. A significant part of the dissertation deals with the question that is it likely that causality operates the other way: Does a mature financial market acts as a strong catalyst for property rights?

The first essay develops a theoretical model of financial intermediation with incomplete information to augment the notion. The model predicts that the relationship does exist and is in fact nonlinear. Thus finance acts as propellant for property rights only after crossing a certain threshold. The second essay presents empirical evidence of threshold effects in the cross country relationship between property rights and finance that are consistent with the theory. Further, in a panel of countries, I show that the exogenous component of financial development helps predict property rights in a sample of countries where financial markets have crossed a threshold level of development.

The final essay of the dissertation deals with the effects of legal environment on financial market. More specifically, it explores the effects of collateral law reforms on firms' perceived access to finance by taking a panel of developing countries. I find evidence that collateral law reforms are effective in improving perceived access to credit. Moreover the effects are more pronounced when they are accompanied by established collateral registries for movable and intangible assets. Finally these beneficial effects seem to increase in the size of the firms.

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Chapter 1: Introduction to the Dissertation

Since the seminal contribution by Douglas North (1967, 1971), a substantial volume of research has been directed toward understanding the importance of institutions in shaping economic behaviors. North describes institutions as "the rules of the game in a society or, more formally, are the humanly devised constraints that shape human interactions." This implies that institutions establish the constraints and determine the costs and benefits, under which individuals take their economic decisions. North's influential work was followed by other seminal contributions, such as, Ronald Coase (1960), Oliver Willismaosn (1975) and Robert Thomas (1973) who emphasized the pivotal roles played by political, legal and economic intuitions.

While North's analysis focused on the broad institutional environment of countries and the role of state, Coase and Willamson analyzed contracts at firm level and property rights which was further expanded by Harold Demsetz (1967). In their perspective, institutions of property rights are crucial since they influence the structure of economic incentives in society. A system of well-developed property rights provides incentives for adopting better technology and leads to investment in physical and human capital. This view has received over whelming support in recent years. Today there is a consensus that that property rights encourage investment (Besley 1995; Knack and Keefer 1995; Johnson et.al 2002), entrepreneurship (Murphy et. al 1991) , innovation (Stern, Porter, and Furman 2000) and are in fact "the fundamental cause of long run growth" (Acemoglu et al 2005). There are a number of channel through which the above relationship could transpire. Property rights protection has a direct impact on firm's investment and

financing decisions. A firm is at risk of getting inadequate returns on its investments when the government can seize private assets and does not provide fundamental protections of property rights. Firms operating in such an environment with insecure property rights are uncertain about their ability to keep the fruits of their efforts and as a consequence, decrease their investment activities.

Along with recognizing the importance of the quality of property rights institution, a predominant view in literature seems to suggest that institutions are persistent, slow moving and they primarily evolve from initial conditions of countries. The influential views on historical determinants of property rights indicate that factors like legal origin, early settler mortality rate or ethnic fractionalization account for much of the variation in institutional sectors. Proponents of the first school of thought (La Porta 1998), draw sharp distinctions between civil law and common law and suggest that under British common law emphasis falls on the rights of individuals to ownership and not on the rights of the state. By contrast, Acemoglu, Johnson and Robinson (2001; 2002) suggest mortality rates amongst European colonies to be an exogenous determinant of property rights. They provide evidence that countries with higher settler mortality rates introduced extractive institutions and did not protect the property rights of individuals. Finally, the third view links ethnic composition to the development of property rights. Easterly and Levine (1997) argue that ruling classes in ethnically diverse countries attempt to expropriate resources from other ethnic factions. Thus these economies also tend to have weaker institutions. Collectively, these views suggest that institutions and conventions have their origins in deep seated historical and geographical factors. Economic institutions such as property rights, labor relations and land tenure often persist

over centuries (Bowels and Naidu 2008).

In this dissertation, I take a departure from this conventional view and ally with the idea proposed by North (1971) which suggests that institutions do change as a response to technological innovations or due to changes in economic environment. For this dissertation, such proximate change in the economic environment is the change in the level of financial development. This focus on financial market is not arbitrary. According to the existing literature, there is a strong link between the quality of property rights institution and the depth and efficiency of the financial sectors. The majority of the studies assert that the laws which protect property rights and promote enforcement of financial contracts also foster higher levels of financial development (La Porta, Lopez-de Silanes, Shleifer, and Vishny (1997, 1998, 2002), Acemoglu, Johnson and Robinson (2002, 2005), Claessens and Laeven (2003), Djankov et.al 2007; De Soto, 2001; Besley and Ghatak, 2009). This is true because law that limits expropriation and better protects the rights of shareholders and creditors raises the price that securities fetch in the marketplace. In turn, this enables more entrepreneurs to finance their investments externally, leading to the expansion of financial markets. Property rights can also catalyze "collateral benefits". Extending and improving property rights allow assets to be pledged as collateral for loan. In developing countries, plagued with credit crunch and capital market imperfections, this greatly improves the functioning and workings of credit markets.

The above literature indicates that the direction of causality runs from property rights to financial development. But is it possible that the reverse is also true? In other words, could a mature financial market provide incentives to better codify and protect

individuals' rights to ownership? This is the question I explore in the first two chapters of my dissertation. The final chapter of the dissertation follow the conventional view seeks to establish an empirical connection between legal reforms and firms' access to finance.

The first chapter offers a theoretical model in establishing a link running from of financial intermediation to the quality property rights institution. In this economy individuals must access external funds for their investments. However, in the presence of information friction, financial intermediaries ration credit and some borrowers are denied loans. Faced with this possibility, borrowers post assets as collateral to improve the terms and conditions of lending. However these collaterals are subjected to encroachment due the lack of property rights. Of course, the property owners can take action against this encroachment in various ways, but such actions come at a cost that is increasing with the fraction of property the owners wish to safeguard.

On the other hand, apart from the obvious gains, protecting property positively influences the contractual arrangements in the financial sector. Specifically, the more an individual spends securing property, the more collateral she can post to better the terms and conditions of a loan contract. The first chapter exploits this tradeoff and shows that the marginal net gain from posting collateral increases with the level of financial development. As a result, more mature financial markets create additional incentives for individuals to secure their right to ownership.

In this chapter I also exploit the above micro foundations to draw conclusions at the aggregate level. In doing so, I do not simply aggregate individuals' behaviors. Instead I take into account that an individual's cost of protecting property is affected by the decisions of other individuals with regard to protecting their own property. This opens

the analysis up to a richer set of outcomes at the aggregate level. In particular, I show that aggregate behavior can be characterized by multiple equilibria. Significantly, the equilibrium which prevails is uniquely determined by the quality of the financial system. The key implication of such analysis is that the number of agents in the economy initiating safeguards against encroachment increases monotonically with the development of the banking system after it has crossed a certain threshold. Below this threshold, improvements in the contracting environment have no effect on the degree to which society secures private property.

In summary, the existing literature assert higher quality property rights institutions promote the enforcement of financial contracts and foster higher levels of financial development. In this chapter I offer a theoretical explanation for the causality to run from financial development to the quality of property rights institution. Further, the analysis suggests that the level of financial development must cross a threshold before it can trigger an improvement in the institutions of property rights.

The theory developed in the first chapter offers a straight-forward testable implication that the relationship between finance and property rights is nonlinear: stronger financial markets can catalyze positive institutional reforms, but only after financial markets have crossed into an intermediate range of development. The second chapter of the dissertation provides a formal test for the theoretical predictions developed in the first chapter of the dissertation. It presents empirical evidence in favor of the nonlinear association between finance and rights.

Making use of a procedure suggested in Hansen (1996; 2000), the analysis tests for a threshold relationship between property rights and finance in a cross-section of

more than 100 countries over a 35 year period from 1970 to 2005. Data on property rights were obtained from is an index assembled by James Gwartney and Robert Lawson and published by the Fraser Institute (with the Cato Institute as its US partner) in their *Economic Freedom of the World: 2009 Annual Report*. A useful feature of the index is that it does not simply reflect laws on the books, but also the overall quality of legal institutions. The primary determinant of financial development, obtained from word Bank, was the credit supplied by financial intermediaries to the private sector divided by nominal GDP at market prices.

Keeping in line with the prediction, the results point to two distinct regimes: One in which the quality of financial systems is poor, and its effect on property rights is weak, and the other where the practice of banking has evolved beyond a certain point, such that further improvements in access to credit are positively associated with the quality of property rights institutions. In particular, I find that property rights are essentially uncorrelated when private credit ratios are below 32 percent. Above this threshold, the data suggest that the variations in financial development help predict stronger property rights.

As a robustness exercise, I also considered the index of property rights published by the Heritage Foundation. Additionally, I varied the measure of financial development. In particular, I consider the log of the ratio of liquid liabilities to GDP, as well as the log of the ratio of commercial bank assets to total banks assets. The predictions of the threshold regression were robust to these variations.

Evidence of threshold effects and non-linearity does not provide a basis for structural inferences. The difficulty is compounded by the fact that financial development

is endogenous. Instrumental variables estimation within endogenous threshold models is difficult. Estimation methods are available only with certain restrictions (Caner and Hansen, 2004). Instead I adopt an alternate route and try to resolve the issue of identification within a panel framework using the Arellano-Bover system GMM estimator. As a benchmark I begin by estimating this relationship for the full sample of countries, using fixed effects as well as the system GMM procedure. The coefficients of finance were positive and highly significant. Based on these findings, it is evident that financial development is strongly correlated with stronger property rights over time.

Further I link our panel analysis to the earlier analysis of thresholds, by splitting the data into two sub-samples based on the previously generated threshold estimates. Thus I estimate two sets of panel regressions; one for the low finance group and one for the high finance group. I found that the size of the coefficient of finance in low finance group were either insignificant or smaller than the high finance group. These results suggest that increases in the volume of credit supplied by the banking sector did not bring forth stronger property rights in countries where the quality of finance was generally low. However, where financial conditions were moderately strong to begin with, improvements in the contracting environment paved the way for stronger property rights.

Other than providing causality from finance to property rights, the results presented in these two chapters also contribute to the literature on potential linkages between real and the financial sector of an economy. Over the past decade a substantial body of research has attempted to identify channels through which financial markets shape growth prospects in countries. There is a general consensus that financial development is conducive to growth because it mobilizes savings for investments, creates

an opportunity to pool risks, improves the allocative efficiency, and lowers transaction costs. In these two chapters I provide both theoretical and empirical evidence in favor of an alternate channel through which financial development may foster economic performance - namely, by creating incentives for countries to strengthen their institutions of property rights.

The last chapter of the dissertation further analyzes the interplay between legal environment and financial market. More specifically it explores the effects of legal reforms on firms' access to fiancé in developing countries. The legal reforms in this context refer to reforms in collateral law. These reforms are a result of an ongoing initiative by the World Bank. The primary objective of these reforms is to ease the credit constraints faced by firms in low and middle income countries.

The motivation behind these reforms is straight forward. It is well established both in theory and empirics that collateral reduces incidences of credit rationing and facilitates efficient allocation of resources. These benefits are particularly large for developing countries where firms' ability to put up collateral is limited (Liberti and Mian, 2010) and credit markets are plagued with informational frictions (Luoto et al. 2004).

In practice these reforms take many forms: setting up of collateral registries, modernizing existing registries or taking initiatives to unify registries electronically across geographical regions. In this chapter, however the focus is on a set of reforms that have allowed for a wider set of assets to be used as collateral.

These assets include movable and intangible assets which prior to the reforms were excluded from the list of collaterals. Studying the effect of this reform is particularly significant in light of the fact that a recent study conducted in 60 low and

middle income countries discovered that private firms in these countries own only 20% of assets in land and buildings which account for nearly 73% of accepted collateral (Fleisig et al. 2006). Thus this reform would allow the usage of the remaining vast quantity of unused or 'dead' capital as collateral.

The objective of the chapter is to study the effects of these reforms on firms' access to finance. I have used the Enterprise Survey dataset published by World Bank to obtain firm-level data on perceived access to finance and other characteristics of firms in 88 low and middle countries over the period 2001-2011. Out of this group, twelve countries have undergone the said reforms in this time period and now allow intangible assets such as machinery, inventory, accounts receivables etc. to be used as collateral.

The analysis yields a number of policy relevant findings. First, I find that broadening the range of assets that can be used as collateral improves access to finance as perceived by firms. However, these effects are more pronounced where these reforms are accompanied or followed by movable collateral registries. The above results are not surprising. While broadening the collateral base helps the borrowers, registries play a significant role in allowing lenders to more accurately evaluate risks, thus avoiding adverse selection. This reduces the information asymmetry between borrowers and lenders, thus ensuring more accurate risk assessment and eventually expanding access to finance.

Secondly, I also examine if this effect differs across firms of different sizes. The motivation behind this exercise lies in the fact that smaller firms face greater hurdles in posting collateral due to limited resources. Thus it is expected that these reforms are targeted towards easing their credit constrains, However I find that the positive effects of

collateral reforms on firms' perceived access to finance increase in the firm size. This raises the possibility that the realized benefits of these reforms are misaligned with the main goal of helping smaller firms.

Chapter 2: Finance and Property Rights: Exploring Other Directions

2.1 Introduction

There is a consensus that property rights encourage investment (Besley 1995; Knack and Keefer 1995; Johnson et.al 2002), entrepreneurship (Murphy et. al 1991) and innovation (Stern, Porter, and Furman 2000). Recently economists have recognized that property rights can catalyze "collateral benefits" which can raise growth through indirect channels. In particular, a system of strong property rights can enhance efficiency in financial sectors. This is intuitive since legislation protecting property often encompasses financial contracts (Kumar et. al, 2001; La Porta et. al, 2002; Claessens and Laeven, 2003; Beck et. al, 2005), and even when it does not, it can improve contracting efficiency by allowing borrowers to pledge collateral (Djankov et.al 2007; De Soto, 2001; Besley and Ghatak, 2009). Here the direction of causality runs from property rights to financial development. But is it possible that the reverse is also true? In other words, could a mature financial market provide incentives to better codify and protect individuals' rights to ownership? This is the question I explore.

There is a great deal of evidence to suggest that institutions are influenced by a cluster of exogenous initial conditions (La Porta et. al, 1998, 1999; Acemoglu et. al, 2001; Berkowitz et. al, 2003), despite this institutions are not immutable. In fact institutions have evolved with the economic and social environment. The main argument in this chapter revolves around this notion. In some countries, especially those adopting market-oriented reforms, the evolution in institutions has been rapid. Based on an index published by the Fraser Institute, which ranks the strength of property rights on a 10-

point scale, property rights strengthened in Chile from 1.1 in 1970 to 7.00 in 2006—a rating comparable to that in Belgium and 0.7 points higher than that in Italy. Similarly, Rodrik, Subramanian and Trebbi (2002) report a 40 percent improvement in an index assessing constraints on the executive branch of government between the 1970s and 1990s in 20 countries. There is also evidence that cross-country differences in the quality of institutions normally traced to differences initial conditions are eroding. Recent evidence suggests a type of "legal convergence" between common law and civil law countries, as legislation protecting shareholder's rights have strengthened in the latter (Armour et. al., 2010).

Sometimes the proximate triggers for institutional reforms have been shifts in ideology—Chile under Augusto Pinochet and China under Deng Xiaoping are good examples. At the same time triggers could be related to economic conditions. For instance Demsetz (1967) and North (1971, 1981) advocate a theory of institutional change, where new institutions are formed and existing institutions are mutated when opportunities for economic profits arise that cannot be captured within existing institutional arrangements. Both argue that technological innovation and new economic markets create new profitable opportunities that trigger reform of existing arrangemental structures. Here I build on this basic idea; I argue that the development of the financial sector can alter the tradeoffs between the costs and benefits of protecting property rights which in turn shapes the evolution of property rights institutions.

This focus on financial markets is not arbitrary. Existing literature hints at a number of channels through which the financial sector can influence the evolution of institutions such as property rights. For example, certain types of financial reforms, in

particular those that relax restrictions on the movement of funds can act as a disciplining force on governments. At the same time an increase in foreign participation can act as a trigger for institutional improvements by raising their expected benefits and reducing incumbents' incentives and abilities to preserve the status quo. Alternatively, since engineering institutions that guard the rights of investors is costly, deep financial markets are a prerequisite for certain institutions to be viable (Miletkov and Wintoki 2008). Here I forward an argument which ties the evolution of property rights to financial structures, by exploring the role of collateral in financial arrangements. As the role of collateral changes along the path of financial development, so do individuals' incentives to invest in the protection of property.

I provide a formal theoretical rationale with the help of a simple model of financial intermediation with incomplete information. In our economy individuals must access external funds to operationalize investments. However, financial intermediaries ration credit. As a result some borrowers are denied loans. Faced with this possibility, borrowers post assets as collateral to improve the terms and conditions of lending. However gaps in the legislative framework allow for encroachment on these assets. This generates push back from property owners, which can take many forms. For instance, owners could litigate, they could employ private security, or they could pay public authorities to protect their assets. Whichever the preferred practice, it comes at a cost that increases with the fraction of property owners wish to safeguard. On the flip side, in addition to the obvious gains, protecting property offers non-trivial benefits whose source lies in how they affect contractual arrangements in the financial sector. Specifically, the

more an individual spends securing property, the more collateral she can post to better the terms and conditions of a loan contract. Against this background, I show that the marginal net gain from posting collateral increases with the level of financial development. Accordingly, mature financial markets generate additional incentives for individuals to secure their right to ownership.

In the analysis that follows, I exploit the above micro foundations to draw conclusions at the aggregate level. In doing so, I do not simply aggregate individuals' behaviors, taking decision parameters, such as the cost of enforcing property rights as given. Instead I recognize that an individual's cost of protecting property is affected by the decisions other individuals make with regard to protecting their own property. This opens our analysis up to a richer set of outcomes for aggregate behavior, characterized by multiple equilibria. Significantly, the equilibrium which prevails is uniquely determined by the quality of the financial system. The key implication is this: the number of agents in the economy initiating safeguards against encroachment increases monotonically with the development of the banking system after it has crossed a certain threshold. Below this threshold, improvements in the contracting environment have no effect on the degree to which society secures private property.

The remainder of this chapter is organized as follows. In section two, I present in detail the theoretical framework and its implications for the relationship between financial development and the degree to which states codify and enforce rights to ownership. Section three concludes with some remarks.

2.2 Theoretical Framework

2.2.1 The Environment

In this model, events unfold in a small open economy over two periods. The economy is populated with a countably infinite number of agents of unit mass. I suppose that these agents are risk neutral, deriving linear utility from consumption which takes place at the end of the second period. Agents can derive income from a number of sources. One source is an initial endowment, $A > 0$, of assets, which generates income payments at the end of the second period. Although these assets offer a gross rate of return, $z > 1$, property rights are not fully enforced in our economy, as a result not all of this income, Az, may accrue to agents.

Income can also be derived from business ventures (or projects). Getting these off the ground entails a fixed investment, $x > Az$, in the first period. Although the cost of "operationalizing" a project is always the same, projects can be of two types—low risk (type-L) and high risk (type-H). Type-L projects yield Qx-units of output with certainty in the second period. Whereas, type-H projects convert x units of investment into Qx-units of output with probability $p_H \in (0,1)$ and zero otherwise. I assume that each agent faces an *ex-ante* probability $\lambda \in (0,1)$ of being an owner of a type-L project[1] and this realization is private information.

Since earnings generated from assets are realized at the end of the second period, agents are unable to finance their own projects. Instead they must contract with banks to obtain a loan of quantity x. I assume that these banks operate in a competitive environment and

[1] Alternatively I could assume agents are randomly endowed with different abilities. For example, a λ-fraction of agents could be endowed with better skills such that the expected returns to their investments are higher. Since skill heterogeneity is not essential to our story, I take a short-cut by assuming that projects with different risk characteristics are randomly allocated across individuals.

have access to a perfectly elastic supply of loanable funds which are priced at the exogenously determined world interest rate, r. Since the project-type associated with any given loan applicant is private information, contractual agreements between the two parties are designed to encourage self-selection on the part of project owners. In particular banks will attempt to separate-types by rationing credit to a fraction of borrowers. However such contracts can only be constructed if the two types of capital producers can be further differentiated. Here I assume that it is feasible for some agents to scale down the size of their business ventures so that even if they are rationed or unfunded, they can produce a *small* amount of output using their own labor as an input in the production process.[2] Here I assume that Type-L project owners have this outside opportunity, which entitles them to α_L-units of output. This opportunity is absent for Type-H capital producers.[3]

In this economy, the arrangements which normally ensure that property rights are well defined and enforced are absent to some degree. However, these arrangements, whether formal or informal, are not exogenously given. Instead they evolve, driven by the strength of private incentives to invest in property rights protection. This contrasts with the orthodox view where property rights are an exogenous institution derived from a set of initial conditions.

Though property rights are slack, I assume that an owner of property can protect a fraction, γ, of her initial endowment and the associated income stream from predation by

[2] It is necessary to assume that the value of this outside opportunity is small relative to the size of project incomes so there are incentives for borrowers to undertake invests in the first place.

[3] Strictly, it is only necessary to assume that outside opportunities available to owners of varying project types differs. Thus,I could assume that Type-H project owners also have access to this opportunity which entitles them to $\alpha_H > 0$ units of output, where $\alpha_L > \alpha_H$. Here for notational convenience I have normalized α_H to zero.

incurring a monetary and/or time cost in the amount of $\tau\gamma$. In practice, this cost can take various forms, such as litigation costs or the costs of hiring private security firms, etc. In addition, I assume that for given legal and institutional structures, the marginal cost of protecting property, τ, increases with the number of people attempting to do so as it increases. This assumption is quite reasonable as increases in the demand for security increases the price paid for those services (e.g. legal services). To justify this assumption further, I draw support from various legal statistics. Consider for instance a country such as India, where in 1950, 1215 cases were filled in India's Supreme Court. By 2008 that number had increased to over 28,000[4]. This increase has led to an enormous backlog of cases. As a result, the current courts system is so overstressed that the time-cost of litigating is best measured in years and decades[5] Similarly, there is evidence that in the US justice system, increased legislative burden has been accompanied by a steadily rising average monetary cost of litigation. In 1982, the combined expenditures (on legal services) by local, state and federal governments amounted to $7 billion. By 2006, these costs had risen to $46 billion. While there has been a steady increase in the number of litigations, the percentage increase in litigation has been much smaller[6] in size resulting in an increase in the average monetary cost of litigation.

2.2.2 Timing of decision making

The timing of events in our economy proceeds as follows. Prior to gaining access to a project, agents choose a value of γ, i.e. they decide how much property they want to safeguard from predation. Next agents are randomly and privately assigned a project,

[4] For details, please refer to 229th Report of the Law commission of India 2009, Government of India.
[5] Currently, writ petitions filed in higher courts of in India take an average of 8-10 years to be heard, while the average duration of trials is 15 years (Chakravarti, Megginson, and Yadav, 2007).
[6] Depending on the courts system, the percentage increase in litigation has varied between 30 and 150 percent (Annual and Federal Justice statistics, 2005).

such that a fraction, λ, are assigned to Type-L projects and the remaining $(1-\lambda)$ are assigned Type-H projects. Once projects are assigned, agents seek to operationalize these ventures, by applying for loans from financial intermediaries who operate in a competitive environment. The terms and conditions for these loans are influenced by the volume of assets, γA, in the possession of agents, which can be posted as collateral. In the second period, projects generate incomes with which agents pay off loans and also consume. The outcomes that transpire from these decisions are determined by solving backwards through the sequence of events. In particular, I first determine how the loan contract is influenced by the choice of γ. This information is then used in sub-sections 4 and 5 to pin down the optimal value of γ for an individual and for the economy as a whole.

2.2.3 Financial Contracts

In the first period, borrowers approach banks for loans to finance investments. The idiosyncratic credit risk associated with each borrower is private information. However, the aggregate *ex ant*e distribution of project types, along with the associated expected returns for each type of investment, and the outside opportunities faced by type-L versus type-H investors is common knowledge. In addition, when approaching banks, loan applicants must reveal the value of their assets, γA, and the associated income generated from those assets $\gamma Az \equiv \gamma\hat{z}$, both of which are costlessly verifiable by financial intermediaries.

I suppose that banks incur a cost when contracting loan agreements. I denote this cost by $\delta > 0$. In practice, costs of financial intermediaries include the cost of providing

liquidity services, agency costs, such as those associated with processing information, enforcing contracts, and screening. I assume that these costs decline along the path of financial development. There is certainly an empirical basis for this assumption. Two empirical measures of intermediation costs are banks' overhead expenditure as a proportion of total assets and bank's net interest rate margin. It is well documented that both measures tend to be higher in less developed financial sectors (e.g. Demirgüç-Kunt and Huizinga 2000; Demigurc-Kunt *et al.* 2003). Accordingly, I interpret lower values of δ as corresponding to improvements in the efficiency of the financial system and assume the value of δ to be known to the financial intermediaries.

Given the above information, a lender offers contracts to borrowers, the acceptance of which implies a binding agreement committing the former to a transfer of funds in the amount x to a borrower and the latter to a repayment of these funds from her future project income. I assume that financial intermediaries operate in a competitive environment and that the terms and conditions of loan contracts offered in the market is common knowledge. Accordingly, loan-applicants will only approach financial intermediaries if the contracts offered are not dominated by other contracts available in the market for loanable funds. Thus, in equilibrium, banks earn zero profits.

I assume that the contract offered by a financial intermediary can be represented by a pair: (R_i, π_i) for $i = H, L$. R_i denotes the gross real lending rate for a contract of type-i and $\pi_i \epsilon [0,1]$ is the probability that a type-i borrower will be granted a loan. For this contract, type-i borrowers receive utility U_i, where $U_i = [\pi_i p_i (Q - R_i)x + (1 - \pi_i)\alpha_i]$, for $i = H, L$; $p_H < p_L = 1$ and $\alpha_L > \alpha_H = 0$. The first term in this expression is the net payoff from risky investments in the event a loan is granted and the project is successful.

The second term is the payoff in the event that the project is not funded. It is easy to see that since $\alpha_L > \alpha_H$, the indifference curves of the two types of borrowers satisfy single-crossing property in the contract plane. This enables lenders to separate borrowers according to their risk types by offering a menu of contracts that are individually rational and incentive compatible.[7] The following proposition fully describes these equilibrium contracts:

Proposition 1: Let$r$ denote the cost of funds for financial intermediaries. If $(Q - R_L)x > \alpha_L$, the equilibrium separating contract for a given value of γ is characterized by:

$$R_L = \frac{xr + \delta}{x};\ R_H = \frac{xr + \delta - (1 - p_H)\gamma\hat{z}}{p_H x} \qquad (1a)$$

$$\pi_L = \frac{p_H Qx - xr - \delta + (1 - p_H)\gamma\hat{z}}{Qx - xr - \delta x}\frac{1}{p_H};\ \pi_H = 1 \qquad (1b)$$

Proof: In competitive equilibrium, banks earn zero economic profit on contracts (R_i, π_i) for $i = H, L$. This implies that $p_i R_i x + (1 - p_i)\gamma\hat{z} = rx + \delta$, for $i = H, L$. Here, the first term on the left hand side is a financial intermediary's expected interest earnings in the absence of default, when the investment project is successful. The second term is the expected amount a financial intermediary can recover by appropriating a borrower's asset γA if the project fails and the borrower defaults. The right hand side of the expression is the cost of lending, which is comprised of the cost of acquiring funds, rx, and the cost of intermediation, δ. The expression for R_i, for $i = H, L$ follows immediately from the zero profit condition, where we assume $p_L = 1$. Throughout the analysis, I assume that there is risk associated with lending and therefore the condition $\gamma\hat{z} < xr + \delta$ must hold. This, in turn, implies that $R_L < R_H$.

[7] For a similar argument, see Rothschild and Stiglitz (1976), Bencivenga and Smith (1993), and Bose and Cothren (1996).

To obtain the expressions for π_i, for $i = H, L$ note that agents of type-H derive expected utility $U_H = [p_H \pi_H (Q - R_H)x]$ from their contracts $C_H = (R_H, \pi_H)$, while the utility of a type-L borrower from her contract $C_L = (R_L, \pi_L)$ is $U_L = [\pi_L (Q - R_L)x + (1 - \pi_L)\alpha_L]$. Now consider a full information scenario where a lender is able to distinguish between a type-L and a type-H borrower. In this case, under competition the offered contracts will still earn zero profit for the lenders and also there is no need for a lender to deny credit to a borrower. Let us denote these first best contracts as $C_H^F \equiv \{R_H, \pi_H = 1\}$ and $C_L^F \equiv \{R_L, \pi_L = 1\}$ for high and the low risk borrowers respectively. Since, $R_L < R_H$, $U_H(C_L^F) > U_H(C_H^F)$ and $U_L(C_L^F) > U_L(C_H^F)$. Therefore, in the presence of information asymmetry, if first best contracts are offered, it is only the type-H agents who has the incentive to misrepresent herself as being of type-L and and not vice-versa. Accordingly, there is no need for financial intermediaries to distort the contract for the type-H borrowers from their first best in order to induce self selection. Accordingly, even in the case of informational asymmetry, type-H borrowers receive their first best contract, which is: $C_H^F = R_H = \left[\frac{xr + \delta - (1 - p_H)\gamma \hat{z}}{p_H x}\right]; \pi_H = 1$. The contract for the type- L group is then determined by solving the following problem:

$$\max_{\{\pi_{LR}\}} U_L(C_L) = [\pi_L (Q - R_L)x + (1 - \pi_L)\alpha_L] \tag{2}$$

subject to the incentive compatibility constraint:

$$p_H (Q - R_H)x \geq \pi_L p_H (Q - R_L) \tag{2a}$$

where R_L and R_H are given by (1a). Given, $(Q - R_L)x > \alpha_L$, it is easy to verify that the incentive compatibility constraint (2a), must bind in equilibrium. By writing (2a) as an

equality, and substituting in expressions for R_H and R_L I obtain an expression for π_L as given in 1(b) ■

Proposition 1 implies that in equilibrium the separation of borrowers by type is achieved by rationing credit to a fraction of low-risk borrowers, $(\pi_L < 1)$–a result that is well-known in the "adverse selection" literature. Also note that $\frac{\partial \pi_L}{\partial \delta} = -\frac{1}{Qx - xr - \delta}\frac{1}{p_H} < 0$ and $\frac{\partial \pi_L}{\partial \gamma} = \frac{(1-p_H)\hat{z}}{Qx - xr - \delta}\frac{1}{p_H} > 0$.

The intuition behind these results is straightforward. Higher values of γ (better protection of property) allow borrowers to post more collateral. This reduces lending risk and the interest rate financial intermediaries charge to both high and low risk borrowers. A similar effect transpires when the cost of intermediation, δ, falls. In both cases, however, the decline in R_H is more than the decline in R_L since $p_L = 1 > p_H$. This, makes the contract C_L less attractive to high-risk capital producers and provides banks with an opportunity to lower the incidence of credit rationing (i.e. increase the value of π_L) while maintaining the incentive compatibility condition. Accordingly the financial sector will supply more credit in more financially mature markets and/or in countries with a strong system of property rights.

2.2.4 An Individual's decision when τ (the cost of protecting property) is exogenous

The analysis in the previous section traces a link bet*we*en financial contracts and the value of γ, i.e. the extent to which indi*vi*duals protect property. Higher values of γ allow individual's to post more collateral when applying for loans, thus improving the terms and conditions of loan contracts. However the safeguarding property against

encroachment entail a cost, $\tau\gamma$, proportional to the value γ. Solving for γ involves optimizing this trade-off. The agent solves this problem with knowledge of the contracts and knowledge of the *ex-ante* probability distribution which determines his chance of being endowed with a project of type-H or type-L, but not knowing what draw *she* will receive from this distribution *ex post*. Accordingly, the agent's problem is to maximize the following objective function:

$$\underbrace{max}_{\gamma} U = \lambda(\widetilde{U_L}) + (1-\lambda)(\widetilde{U_H}) - \tau\gamma, \tag{3}$$

where, $\widetilde{U_H}$ and $\widetilde{U_L}$ denote a borrower's life-time income if the borrower is endowed with project H or L, respectively.

Proposition 2: Let γ_{max} and γ_{min} denote the maximum and the minimum attainable levels of property rights. Further, define $\Omega(\delta) \equiv \frac{\lambda(1-p_H)(Qx-xr-\delta-\alpha_L)}{p_H(Q-xr-\delta)}$. An agent will optimally choose $\gamma = \gamma_{max}$ if $\Omega(\delta) \geq \tau$ and $\gamma = \gamma_{min}$ if $\Omega(\delta) < \tau$.

Proof: The expected life-time payoffs to a type-L project is given by the expression, $\widetilde{U_L} = \pi_L[(Q-R_L)x + \gamma\hat{z}] + (1-\pi_L)(\gamma\hat{z} + \alpha_L)$. The first term in this expression is the net payoff from the risky project in the event the loan is granted and the project is successful. The second term represents the payoff in the event the project is not funded. This term includes both asset incomes, $\gamma\hat{z}$, and income from the outside opportunity, α_L. The equivalent expression for a type-H borrower is given by $\widetilde{U_H} = p_H\pi_H[(Q-R_H)x + \gamma\hat{z}]$, where I assume $\alpha_H = 0$. Using these expressions along with the expressions for R_i and π_i, $i = H, L$, from (1a) and (1b), it follows from equation (3) that $\frac{\partial U}{\partial \gamma} \equiv \Omega(\delta) - \tau$. Accordingly, an agent should set $\gamma = \gamma_{max}$ and $\gamma = \gamma_{min}$ when $\Omega(\delta) \geq \tau$ and $\Omega(\delta) < \tau$, respectively■

These results are easy to interpret. A higher γ implies both a welfare gain and a welfare loss. The term $\Omega(\delta)$ represents the marginal benefit of improving property rights. This includes the welfare gain which follows from the reduction in credit risk and the consequent improvement in the terms and conditions of loan contracts. Whereas, τ represents the marginal costs associated with property rights improvement. Depending on which is greater, the agent sets γ at either its maximum or minimum value.

In presenting these results I have focused on one parameter-- δ—the cost of financial intermediation, Note in particular that $\Omega'(\delta) < 0$. This follows since a lower costs of financial intermediation improve the terms and conditions of loan contracts, such that agents receive higher marginal benefit from putting up their future income as collateral. Accordingly, the marginal benefit to an agent of securing higher property rights is greater the lower this cost.

2.2.5 Endogenous τ and Economy wide Outcomes

The results obtained above *c*haracterize the precise conditions under which an individual will seek to protect her property. This condition depend on two economy wide variables—δ and τ. For the purposes of this chapter, I treat δ as exogenous since our principal focus is on the role of financial development in influencing the quality of property rights. However, keeping in line with the stylized facts presented earlier, I treat the cost of enforcing property rights as an endogenous outcome dictated by the aggregate behavior of individuals. In particular, I postulate that the marginal cost of protecting property, τ, increases with the number of people protecting their property. Formally, I assume that $\tau = \tau(\mu)$ and $\tau'(\mu) > 0$, where $\mu \in [0,1]$ denotes the fraction of agents that enforce their property right to the fullest extent, i.e., set $\gamma = \gamma_{max}$.

The present framework outlines a scenario where the cost of enforcing property rights not only influences the behavior of individuals, but also their behavior in aggregate. Clearly, such a scenario raises the possibility of a variety of equilibria, each of which is characterized by different levels of property rights. Significantly, the following proposition demonstrates how the equilibrium choice varies when δ takes a value from high to low indicating a transition from low to high levels of financial development.

Proposition 3:

(i) There exists a critical level of financial development, δ_c, such that when $\delta > \delta_c$ the equilibrium in the economy is characterized by a unique behavior profile where all agents set $\gamma = \gamma_{min}$.

(ii) There exists $\delta_1 < \delta_c$ such that μ the fraction of agents who set $\gamma = \gamma_{max}$ increases monotonically when δ decreases in the interval (δ_1, δ_c).

Proof: I begin by defining $\tau_1 = \tau(\mu = 1)$ and $\tau_0 = \tau(\mu = 0)$. Evidently, $\tau_1 > \tau_0$, since $\tau'(\mu) > 0$. Further define, $\delta = \delta_1$ such that $\Omega(\delta_1) = \tau_1$ and $\delta = \delta_c$ such that $\Omega(\delta_c) = \tau_0$. Since, $\frac{\partial \Omega}{\partial \delta} < 0$ and since $\tau_1 > \tau_0$, I have $\delta_c > \delta_1$ (Please refer to figure 2.1).

Suppose that $\delta > \delta_c$, and consider a behavior profile where all agents set $\gamma = \gamma_{min}$. Accordingly, $\tau = \tau_0$ .Since, by definition, $\Omega(\delta_c) \equiv \tau_0$, and $\frac{\partial \Omega}{\partial \delta} < 0$, it follows that $\Omega(\delta) < \tau_0$ for $\delta > \delta_c$. Therefore, from proposition 2, no individual agent has an incentive to deviate from this behavior profile. This is a unique equilibrium. To see this consider the behavior profile at the other extreme, i.e. when all agents set $\gamma = \gamma_{max}$. Accordingly, $\tau = \tau_1 > \tau_0$ and $\Omega(\delta) < \tau_1$. In this case, from an individual agent's

standpoint it is optimal to deviate and set $\gamma = \gamma_{min}$ and therefore the aggregate equilibrium outcome cannot be supported by the behavior profile $\gamma = \gamma_{max}$.

Now suppose, $\delta \in (\delta_1, \delta_c)$, and consider the pure strategy behavior profile where $\gamma = \gamma_{min}$ for all agents. In this case, $\Omega(\delta) > \Omega(\delta_c) = \tau_0$. Therefore it is optimal for an agent to deviate from her behavior profile and set $\gamma = \gamma_{max}$. Using a similar argument it is easy to see that $\gamma = \gamma_{min}$ cannot also be an equilibrium since $\Omega(\delta) < \tau_1$. There exists however an equilibrium supported by a mixed-strategy profile. To see this, consider $\delta = \delta_a \in (\delta_1, \delta_c)$. Since $\Omega'(\delta) < 0$, $\Omega(\delta_1) > \Omega(\delta_a) > \Omega(\delta_c)$. Now, consider a mixed–strategy where μ_a fraction of agents set $\gamma = \gamma_{max}$ and the rest set $\gamma = \gamma_{min}$, so that τ assumes value $\tau(\mu_a)$ which lies between τ_0 and τ_1. For a given level of financial development, δ_a, the value of μ_a that solves $\Omega(\delta_a) = \tau(\mu_a)$ supports a mixed behavior profile as an equilibrium where only μ_a fraction of agents choose $\gamma = \gamma_{max}$. Finally, consider another $\delta = \delta_b$ such that $\delta_b \in (\delta_1, \delta_c)$ and $\delta_a > \delta_b$ Suppose that μ_b solves $\Omega(\delta_b) = \tau(\mu_b)$. Since, $\Omega(\delta_b) > \Omega(\delta_a)$ and $\tau' > 0$, it follows that $\mu_b > \mu_a$. Accordingly, in the interval (δ_1, δ_c), the fraction of agents choosing $\gamma = \gamma_{max}$ increases as δ decreases■

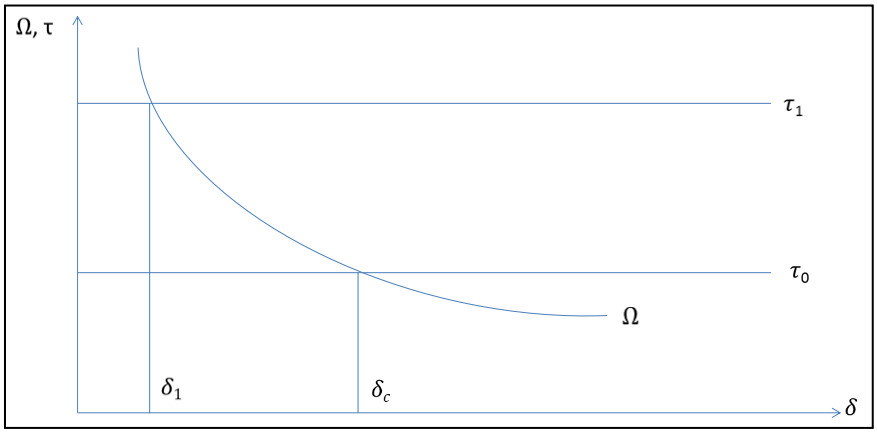
To see the intuition underlying proposition 3, note that by choosing to protect property, agents receive the added benefit of improved lending terms. The extent of these benefits however is contingent upon the level of financial development. If $\delta \geq \delta_c$, this benefit from protecting property is so low that that it is optimal for an agent to choose $\gamma = \gamma_{min}$ even if she is facing the lowest cost of enforcement, τ_0. As δ decreases in the interval $\delta \in (\delta_1, \delta_c)$, the marginal benefit from protecting property increases and creates

incentives for individuals to enforce property rights. At the same time, an increase in the number of individuals choosing to protect property increases the cost of property rights enforcement. The benefit arising from a fall in δ compensates this increasing marginal cost and accommodates more individuals to take initiatives towards stronger property rights enforcement. Accordingly, a higher level of financial development gives rise to an environment that is suitable for a better property rights institution.

2.3 Conclusion:

This essay provides a theoretical model to explore association between finance and property rights. The argument is simple: enforcing property rights is costly. However stronger property rights enable borrowers to improve the terms of their financial contracts by posting collateral. This marginal benefit to securing property increases as financial markets mature and the costs of intermediation decline. Thus incentives for individuals and society to incur the necessary costs of better enforcing property rights rise. In spite of its simplicity, the model produces a rich variety of outcomes as a result of a mutual interaction between individual decision making and aggregate behavior. In particular, I am able to distinguish between two types of financial development regimes. In a low quality regime the effect of finance on the development of property rights is weak. However, when financial development crosses a certain threshold, further reductions in the cost of financial intermediation catalyze institutional reforms that better secure property.

Figure 2.1 Multiple Equilibria



Chapter 3: Threshold Effects of finance on property rights

3.1 Introduction

There is a wide consensus that institutions of property rights tend to be persistent and evolve from a cluster of initial conditions. However in the previous section it was established that they do indeed change over time owing to changes in some proximate factors and one of the factors that contributes to the reforms in institutions of property rights is financial development. I established that by developing a simple model of financial intermediation with incomplete information. The theory produced a straight-forward testable implication that the relationship between finance and property rights is nonlinear: stronger financial markets can catalyze positive institutional reforms, but only after financial markets have crossed into an intermediate range of development. This essay provides formal empirical evidence in favor of the nonlinear association between finance and property rights.

A first look at data on property rights and a measure of financial development—the volume of credit allocated to the private sector by financial intermediaries—suggests a pattern of co-movement that is consistent with these predictions. In Figure 3.1 chart an index of property rights (constructed by Fraser Institute) over five year intervals from 1970 to 2005 along with the average volume of private credit to GDP in the five preceding years. I divide our data into two equal sized groups, one composed of countries where the volume of private credit is less than 30 percent of GDP and the other composed of countries where private credit exceeded this 30 percent cut point. In each case, I plot for each time period, the median levels of finance and property rights across the countries in

our sample. In the low finance group the volume of private credit and property rights do not appear to commove, whereas in the high finance group, they do.

I begin by examining the evidence on nonlinearities in the relationship between property rights and finance. In particular, I test for a threshold in this relationship in a cross-section of over 100 countries using a procedure suggested in Hansen (1996; 2000). Consistent with our theory, our results suggest two distinct regimes. One in which the quality of financial systems is poor, and where its effect on property rights is weak, and one where the practice of banking has evolved beyond a certain point, such that further improvements in access to credit are positively associated with the degree to which countries enforce property rights.

After establishing the existence of a threshold, I separately analyze the determinants of property rights for observations in the low and high finance regimes in a panel composed of up to 116 countries. The panel GMM analysis confirms earlier finding within the cross-section that the effect of finance on property law varies across low and high finance regimes, while enabling us to make some structural inferences.

The remainder of this chapter is organized as follows: Section two, describes data and briefly outlines the empirical methodology. In section three, I present the results. Finally section four concludes with some remarks.

3.2 Data and Methodology:

3.2.1 Outline of the Methodology:

The first set of evidence I present tests for possible nonlinearity in the form of a threshold effects in the finance-property rights relationship. The approach is based on

recent statistical innovations that provide a basis for testing non-nested hypotheses where parameters are unidentified under the null (Hansen, 1996; Hansen, 2000). In particular, I estimate variations of the following regression:

$$\pi_i = \varphi_i\theta_1[I(\varphi_i \leq \tau)] + \varphi_i\theta_2[1 - I(\varphi_i \leq \tau)] + u_i. \qquad (1)$$

The above specification allows the association between financial development, φ_i, and property rights, π_i, in country i to vary with φ_i.In particular observations are divided into two regimes depending on whether the threshold variable, financial development, is smaller or larger than the threshold τ. The indicator function $I(\varphi_i \leq \tau)$ allows the slope coefficients on financial development to vary across the two regimes.

The unknown threshold τ is estimated by minimizing a loss function across values of φ_i (see Hansen, 1996; 2000 for details). Testing the assertion that there are distinct regimes across which finance has markedly differing effects on the enforcement of property rights amounts to testing a hypothesis about τ. Since τ is not identified under the null hypothesis ("no threshold"), the asymptotic distribution of classical test statistics is not chi-squared. This is problem has been investigated in Hansen (1996) who suggests a test based on difference between the sum of squared errors under the null, S_0, and alternatives, $S_1(\hat{\tau})$, i.e. $F = \frac{S_0 - S_1(\hat{\tau})}{S_1(\hat{\tau})/n-k}$. The distribution of F is non-standard and depends on nuisance parameters. Hansen (1996) however shows that a bootstrap procedure can approximate this distribution, so p-values based on simulation are asymptotically valid.

Evidence of threshold effects and nonlinearities may be suggestive however they are not a basis from which I can make structural inferences. The difficulty is that

financial development is endogenous. In addressing this issue I face a hurdle. Instrumental variables estimation within endogenous threshold models is difficult. Estimation methods are available only with certain restrictions (Caner and Hansen, 2004).

Here I present a second set of evidence where I take an alternative approach. I attempt to resolve the issue of identification within a panel framework using the Arellano-Bover system GMM estimator. I link our panel analysis to the earlier analysis of thresholds, by splitting the data into two sub-samples based on the previously generated threshold estimates. Thus I estimate two sets of panel regressions; one for the low finance group for which $\varphi_{i,j} \leq \hat{\tau}$ and one for the high finance group where $\varphi_{i,j} > \hat{\tau}$. The conjecture is that financial development will have little effect on the degree to which governments enforce property rights in countries where financial markets are underdeveloped to begin with. Thus the size of the coefficient on the finance variable in subsample of panel regressions where $\varphi_{i,j} \leq \hat{\tau}$ should be small and may be statistically insignificant. By contrast, in countries where financial market development has crossed a threshold, further advancements in the financial sector should encourage stronger property rights legislation and enforcement. Thus for the sample where $\varphi_{i,j} > \hat{\tau}$, I would expect to isolate a strong positive relationship between financial development and property rights within countries over time.

3.2.2 Data on property rights and finance:

Measuring Property Rights:

Measures of property rights-enforcement fall into two classes. One class aims to capture the security of intangible assets—specifically intellectual property. Another

class provides an assessment of the scope of laws and regulations governing the security of property as they apply more generally. Since our focus is not exclusively on intellectual property, it makes sense to draw from this latter group. Our primary measure of property rights is an index assembled by James Gwartney and Robert Lawson and published by the Fraser Institute (with the Cato Institute as its US partner) in their *Economic Freedom of the World: 2009 Annual Report*.

An important feature of the index is that it does not simply reflect laws on the books, but also the overall legal environment as it relates to the protection of property rights and the overall quality of legal institutions. Countries are rated on a scale from 0 to 10—zero being the lowest—on the degree to which the judiciary is independent and free of government interference, on the impartiality of the courts, on the basis of the protection of property, the degree of military interference, the integrity of the legal system, and the degree of enforcement of legal contracts and the extent of regulatory restrictions on the sale of real property.

The large cross-country dimension of the Fraser Institute's data (141 countries) is useful since our intent here is to identify complex, potentially nonlinear, relationships. Unfortunately drawing structural inferences from cross-country analyses is difficult. Fortunately, these data also offer a time dimension. They are available for a 37-year period from 1970 to 2007. Between 1970 and 2000 these data were reported at five-year intervals, since 2000 however these data are published at an annual frequency. The time-series component of these data provides a basis for resolving the identification issue within a panel framework, while also allowing us to control for country-specific effects.

While the presumption is that the bulk of variation in property rights is across countries, this is not in fact the case. In fact the within-variation over time in the Fraser Institute's measure is almost as large as the between-variation across countries (Table 3.1). Even though the median country rating has changed very little, increasing from 6.25 in 1970 to 6.7 in 2005 (the average rating also changed only slightly from 6.1 to 6.6), in some countries the extent of enforcement of property rights has changed substantially. In Chile, for instance, under Pinochet property rights were strengthened. This respect for contractual agreements continued even in the aftermath of that regime. As a result between 1970 and 2005, Chile's property rights rating increased by 4.11 points. By contrast Venezuela, which has introduced various land reforms, has seen its property rights rating drop by 2.16 points since 1970.

An alternative measure of property rights is the rating published by the Heritage Foundation. These data have been used extensively in the literature (La Porta et al., 1999; 2002; Acemoglu et. al., 2001; Claessens and Laeven, 2003). This measure provides an assessment of individuals' abilities to accumulate private property, which is secured by transparent legislation and government enforcement, together with the likelihood of expropriation, the efficiency of the judiciary, the presence of corruption within the judiciary and the enforceability of contracts. Countries are rated on a scale from 0 to 100, with higher values indicating stronger property rights. For our purposes, it is useful to rescale these data from 0 to 10.

Although these data are available for a large cross-section, their time series dimension is short; ratings on property rights are available on an annual basis starting in 1995, making these data less than ideal for panel analysis. In the sensitivity section

below I consider robustness exercises that focus specifically on the cross-country dimension of these data.

Measures of Financial Development:

The World Bank's *Financial Structure Database* provides data on a wide array of country-level financial indicators. Of these, measures of the size of the financial system continue to be the most widely used proxy for efficiency of financial markets. Research has focused in particular on the volume of credit supplied by the financial system to the private sector (normalized by GDP). The intuition underlying this measure is straightforward: financial systems that allocate more credit to the private sector are likely to monitor firms more closely and exercise greater corporate control (Beck et al., 2000). The bulk of our data analysis is based on this indicator. However, in some sensitivity exercises, I also consider two alternative measures of financial depth—the sum of currency, demand and interest-bearing liabilities of banks and other financial intermediaries (normalized by GDP); and the ratio of commercial bank assets to the sum of commercial and central bank assets. Both of these measures have also been used extensively in empirical financial research (see Beck et al., 2000 for details).

3.3 Results:

3.3.1 An Initial Look at the Data

In this section, I provide evidence on the relation between finance and property rights. I present this in stages. I begin by regressing property rights against the *logarithm*

of finance[8] and a set of other controls. I do not fully parameterize this relationship. Instead I estimate a partially linear additive model (Stone, 1985), where the finance variable enters the equation additively, but is estimated using univariate smoothers, so our regression equation takes the following form:

$$\pi_i = s(\varphi_i) + x'_i\beta + u_i, \qquad (2)$$

here π_i is the average of the Fraser Institute's property rights rating in country i over the sample period—from 1970 to 2005—and φ_i is the average volume of private credit to GDP (over the same period).

At this stage I keep our specification simple. In particular, x_i is composed of a dummy for British legal origin, a country's latitude and ethnic fractionalization. This specification will form the baseline model like chapter one and is motivated by three predominant views on historical determinants of property rights. This specification will form our baseline model and with the exception of a dummy for Catholicism, which I include later, the specification is identical to that considered by Ayyagari, Demirgüç-Kunt and Maksimovic (2006). Though parsimonious, this specification is motivated by three predominant views on historical determinants of property rights.

The first of these argues that differences in legal traditions influenced how property rights evolved (Hayek, 1960; La Porta et. al., 1998). Proponents of this view draw sharp distinctions between civil law and common law. Under British common law, emphasis falls on the rights of individuals to ownership and not on the rights of the state. Moreover, unlike the French (and German) civil code, common law does not limit jurisprudence, which has allowed laws to adapt more efficiently to changing contractual

[8] The distribution of data on the volume of private credit as well as other measures of the size of financial sectors are typically positively skewed, as such it is typical to transform these data by taking logarithms.

needs.

By contrast Acemoglu, Johnson and Robinson (2001; 2002) argue that what matters is not the identity of the colonial power, but rather their proclivity to establish institutions. In inhospitable environments, Europeans introduced extractive institutions, which did not protect the property rights of individuals. Often these were countries close to the equator with tropical climates and a high incidence of disease. Acemoglu, Johnson and Robinson (2001; 2002) argue using mortality rates amongst European colonists as an exogenous determinant of property rights. Here I use latitude instead in our *baseline* specification, as data on the latter are only available for a significantly smaller set of countries.

A third view links ethnic composition to the development of property rights. Easterly and Levine (1997) argue that ruling classes in ethnically diverse countries attempt to expropriate resources from other ethnic factions. Thus these economies also tend to have weaker institutions.

While the additive model in (2) does not provide a basis for testing for threshold effects, its flexibility provides an important exploratory foundation which may reveal nonlinearities in the relationship between property rights and finance. Of interest is the pattern of variation of the smoother $s(\varphi_i)$. In particular, here I am interested whether this variation suggests an approximate classification of observations into distinct regimes.

A plot of the nonparametric smoother, $s(\varphi_i)$, is presented in Figure 3.2. The plot provides some evidence of nonlinear structure in the relationship between property rights and finance. In particular, the nonparametric smooth $s(\varphi_i)$ appears approximately kinked when the volume of private credit is roughly between 20 and 22 percent of GDP.

Although this evidence does not provide a formal basis for rejecting linearity, it is suggestive. The ratio of private credit averaged less than 22 percent of GDP in approximately 35 percent of the countries in the sample. Within that group the association between private credit to GDP and property rights is essentially zero. In the complementary sub-sample, this association is strongly positive.

Below I present evidence which formally tests for the presence of threshold effects in the relationship between finance and property rights.

3.3.2 Threshold Regressions

In this section I apply methods developed in Hansen (1996; 2000), to split the data into two groups, based on the measure of financial development. To this end I augment and then estimate equation (4), using additional regressors, beginning with the baseline specification. I then extend this baseline in various ways.

First, I build on the endowment theory of property rights by including a measure of mortality rates amongst early European settlers (Acemoglu, Johnson and Robinson, 2001). Next, I consider the importance of religious identity—Catholicism in particular—as a historical determinant of property rights. The argument here is that Catholicism is associated with societies where bonds between the church and state limited the development of property rights (Putnam, 1993; Landes, 1998; Stulz & Williamson, 2003).

In the third specification, I examine the importance of political factors in shaping the rights to ownership in countries. North and Weingast (1989) argue that constraints on governments' abilities to abrogate individuals rights to ownership are associated with stronger property rights. Thus I introduce a control for constraints on the executive.

Finally, I consider the role of economic influences on property rights, by extending the specification to include real per capita income, as well as trade and financial openness. Gradstein (2004) argues that higher real per-capita incomes are associated with stronger property rights, since higher incomes relate to abilities of governments to invest in institutional development. Income may matter also for the development of intellectual property rights (Maskus, 2000). Others have argued that greater openness disciplines governments and begets better institutions (Wei, 2000). This view has been extended to include financial globalization (Stulz, 2004). The argument here is that greater capital mobility weakens the ability of states to expropriate, by providing domestic investors with opportunities to channel funds abroad.

I estimate two versions of equation (1). First I estimate the following model:

$$\pi_i = \varphi_i\theta_1[I(\varphi_i \leq \tau)] + \varphi_i\theta_2[1 - I(\varphi_i \leq \tau)] + x_i'\beta + u_i, \qquad (3a)$$

i.e. I augment (1) using additional regressors, x_i, but constrain the slope coefficients on these variables to be the same across the two regimes. In the case, where x_i and φ_i are uncorrelated, constraining the coefficients on x_i will not bias the test, while at the same time centering attention on the finance variable. Thus any evidence of a threshold is based solely on the additional explanatory power provided when I allow the effect of finance to change across regimes. Unfortunately, in general x_i and φ_i will not be uncorrelated, and the coefficients on our other explanatory variables, x_i, could also switch across regimes. Restricting the model coefficients on x_i could therefore impart a bias in estimates of θ_1 and θ_2. If this bias is not uniform across regimes, and there is no reason to think why it would be, then our test may erroneously point to a threshold when

none are present. Thus, in addition to the restricted model (3a), I also consider the case where the model parameters on each of our controls are allowed to vary freely across regimes, i.e. I estimate the following specification:

$$\pi_i = (\varphi_i\theta_1 + x_i'\beta_1)[I(\varphi_i \leq \tau)] + (\varphi_i\theta_2 + x_i'\beta_2)[1 - I(\varphi_i \leq \tau)] + u_i. \quad (3b)$$

The results from these exercises are arranged across two panels in Table 3.2. The dependent variable is the average of the Fraser Institute index from 1970 to 2005. In Panel A, I allow the coefficient on the intercept and finance variables *only* to change across regimes, i.e. I impose cross-regime restrictions on our additional controls. In Panel B, I estimate a model without imposing cross-regime restrictions. To save space, in Panel B I only report the coefficients on the finance variable.

I find strong evidence in favor of a split (based on finance) in every model specification when I impose cross-regime restrictions on our other model parameters (Table 3.2, Panel A). In each case, I can reject the null of linearity at one percent or better. The strength of this evidence reflects large differences in the effect of finance on property rights. In the low regime, the coefficient on finance is 0.023 and statistically insignificant. In the high finance regime, the coefficient on finance increases to 1.315 with a t-statistic larger than 4.5.

In the baseline specification, the regimes split when the volume of credit to the private sector is about 32 percent [=exp(3.49)-1] of GDP. As such approximately 57 percent of the countries lie in the low finance regime. Across the specifications, the range of variation in the threshold parameter is between 22 [=exp(3.13)-1] and 36 percent

[=exp(3.60)-1] of GDP. The size of the coefficient on finance also varies across specifications however importantly in the low regime the effect of finance is not statistically different from zero in four of the five model specifications. In the one case where its effect is statistically significant, the coefficient is negative. By contrast in high finance regimes, the coefficient on finance is always positive and strongly statistically significant.

The results are qualitatively similar when I relax cross-regime restrictions. In most cases, the finance threshold occurs at roughly the median level of private credit ratios—between 31 and 32 percent of GDP. Moreover, evidence of a split is strong. Importantly also the pattern of variation in the effect of finance across regimes is both qualitatively and quantitatively similar to our results based on cross-regime restrictions, except perhaps when I control for European settler mortality rates, which significantly shrinks our sample.

The coefficients on some of other control variables are consistent with earlier research. For instance I find that countries further from the equator tend to have stronger property rights. There is strong support also for the view that British legal traditions have positively influenced the development of property rights. On average countries with British legal traditions scored between 0.54 and 0.714 points higher on the 10-point Fraser scale (Table 3.2, Panel A). Thus while the relationship between British legal traditions and the development of property rights may be statistically important, quantitatively its effect is small. Consistent also with earlier evidence I find that countries with high mortality rates amongst European colonists developed weaker property rights institutions (Acemoglu, Johnson and Robinson, 2001; 2002). The log of European settler

mortality rates varies between a low of 2.15 in Australia, which receives a property rating of 8.32, and a high of 7.99 in Mali, which receives a score of 4.41. Based on my estimates, I can attribute about a third of this difference to the variation in settler mortality rates. By contrast the effect of political constraints is quantitatively more significant. On average, countries with strong constraints on the chief executive receive a score that is approximately 3 points higher on the Fraser index.

I find also that higher incomes and increased trade openness are associated with stronger enforcement of property rights (Table 3.2, Panel A, column 5b), although the effect of trade openness is not statistically significant. Increased financial globalization by contrast is associated with weaker property rights, which is the opposite of what I might expect, although this effect is insignificant.

While the evidence of thresholds is consistent with our claim of nonlinearity, it is also open to alternative interpretations. At issue is the proximate determinant of the nonlinearity in the finance-property rights relationship. Does this relationship hinge on the level of financial development, or is it the case that countries with weaker financial markets are also less developed, where in general, the quality of data is worse, and relationships appear weaker? That is, is the relevant threshold variable finance, or is it income?

Choosing between these correlated alternatives is difficult. Evidence of linearity is easily rejected in favor of income-based thresholds [Table 3.3, columns (1a) and (1b) and (2a) and (2b)]. The estimated cut point varies. In a specification with cross-regime restrictions, it is $1,188. When I relax these coefficient restrictions it is $2,540. Yet while specification matters for the composition of low- and high-income groups, the effect of

finance on property rights is not very sensitive to this variation in cut points. In the low-income regime the coefficient on finance is 0.30 and statistically insignificant and in the high regime it varies between 1.22 and 1.26. Both qualitatively and quantitatively these coefficients are similar to those reported in Table 3.2 and Table 3.3, columns (3a) and (3b) and(4a) and (4b), where I use the same specification, but allow finance to be the threshold variable.

Based on this evidence it is not clear whether the threshold variable is finance or income. At the same time it is not immediately obvious how I might jointly test for linearity versus each of these alternatives. Here I consider a two- step approach. In the first step, I separately estimate the cut points in finance, $\hat{\tau}_{\varphi}$, and income $\hat{\tau}_{y}$. These estimates are obtained from the constrained and unconstrained threshold regressions reported in Table 3.3. In the second step, I assume these thresholds are *known*, estimate the following regression:

$$\pi_i = \varphi_i\theta_1 + \varphi_i\theta_2\left[I\left(\varphi_i > \hat{\tau}_{\varphi}\right)\right] + \varphi_i\theta_3\left[I\left(y_i > \hat{\tau}_{y}\right)\right] + \gamma y_i + x_i'\beta + u_i \qquad (4)$$

and then test for the statistical significance of the parameters θ_2 and θ_3. The function $I\left(\varphi_i > \hat{\tau}_{\varphi}\right)$ is a dummy for countries in the high finance regime and $I\left(y_i > \hat{\tau}_{y}\right)$ is a dummy for countries with per-capita incomes greater than $\hat{\tau}_{y}$. This specification allows the effect of finance to shift as financial credit and income cross their respective critical values $\hat{\tau}_{\varphi}$ and $\hat{\tau}_{y}$.

Although this approach is somewhat ad hoc, that the coefficient on the interaction between finance and high-income countries, θ_3, is either not statistically significant or is

negative [Table 3.4A, columns (1) and (2) and Table 2.4B] is suggestive. Thus either income has no effect on the finance-property rights relationship, as our results in column (2) of Table 2.4A suggest, or it does, but only for very low income countries, and in the opposite direction. By contrast the effect of finance does appear to increase when the volume of credit exceeds a critical threshold $\hat{\tau}_{\varphi}$. There is a then a tentative basis for attributing the nonlinearity observed in Table 2.3 to financial development rather than income.

However, importantly a "kink" in the finance-property rights relationship is not by itself direct evidence in support of causality, as within each regime the direction of causality could be running from property rights to stronger financial market development. Thus establishing the fact that finance "causes" a change in property rights in nonlinear fashion would require dealing with identification issues in the panel frame work.

3.3.3 Panel Regressions

Since it is difficult to isolate the structural component in the relationship between property rights and finance in the cross-section, I attempt to generate some traction on this issue by exploiting the time-series variation in the Fraser Institute's data. In particular, I re-estimate the property rights-finance relationship in a panel, using as instruments, lags of the endogenous regressors. I use the system-GMM estimator (Arellano and Bover, 1995; Blundell and Bond, 1998) and the justification of use of the approach is same as chapter one , i.e. it is well suited for persistent macroeconomic data.

The property rights equation no longer includes country-specific effects. Hence the baseline is simply a regression of property rights in one of eight time periods $j = 1970, 75, \ldots, 2005$, against the average private credit to GDP ratio in the each of five

preceding years. In addition, I extend this specification by first including controls for partisanship and then for initial period real per-capita income, trade and financial openness. Since my goal is to examine how the effect of finance on property rights changes across regimes, I split our data into two subsamples using our earlier threshold estimate (private credit ≈ 32 percent of GDP) and estimate the relationship between property rights and finance within each subsample.

As a benchmark I begin by estimating this relationship for the full sample of countries, using fixed effects as well as the system GMM procedure. Based on these findings, it is evident that financial development is strongly correlated with stronger property rights over time (Table 3.5, column 1). Thus while institutional change sometimes occurs slowly, there is enough time variation in the measure of property rights with which I can identify a statistically meaningful relationship with financial development. The second-order serial correlation in the residuals of property rights regression should be absent, and the results suggest that they are (Table 2.5, column 2).

There is therefore a tentative basis from which I might conclude that stronger financial markets lay the groundwork for stronger property law. But does this relationship change depending on the level of financial development as our theory predicts? To examine this issue, I split our data into low and high finance regimes and re-estimate our property rights equation in each sub-sample. Across these sub-samples there are sharp differences in the effect of finance on property rights. In the low regime the coefficient on finance ranges between 0.02 and 0.2. In the high regime this range of variation is between 1.5 and 2.0 and the coefficients are highly statistically significant. In each of the specifications, in each sub-sample, second order serial correlation is absent and our

results also pass the Sargan test for over-identifying restrictions.

These results suggest that increases in the volume of credit supplied by the banking sector did not bring forth stronger property rights in countries where the quality of finance was generally low. However, where financial conditions were moderately strong to begin with, improvements in the contracting environment paved the way for stronger property rights.

3.3.4 Robustness

Although the findings hold in samples differing in country-coverage and specification, questions related to robustness remain. A particularly important criticism is that two key variables—the quality of financial intermediation services and the quality of institutions—are measured with error. Since neither is observed directly, there is little scope for addressing this criticism in a completely satisfactory manner, however at a minimum I might insist that the results are robust across viable alternatives.

In Table 3.6, I provide additional evidence of nonlinearities in the finance-property rights relationship. The results are arranged in panels. In Panel A, I continue to measure financial development using the logarithm of the volume of credit provided to the private sector, however in addition to Fraser Institute data; I also consider the index of property rights published by the Heritage Foundation. In Panels B and C, I vary the measure of financial development. In particular, I consider the log of the ratio of liquid liabilities to GDP, as well as the log of the ratio of commercial bank assets to total banks assets. In each case, the relevant specification is the baseline, with and without cross-regime restrictions. The cells are shaded such that darker cells correspond to instances when the threshold is statistically significant, the effect of finance is statistically

indistinguishable from zero in the low regime and positive and statistically significant in the high regime. Cells receiving a lighter shade satisfy two of these criteria.

The results point to strong evidence of a nonlinear relationship between property rights and finance when the latter is measured as the logarithm of the volume credit provided to the private sector. The threshold level of finance consistently splits the sample within the 55^{th} to 60^{th} percentile range. Moreover the coefficients on finance in the low and high regimes are of similar across the different measures of property rights. Similar nonlinearities are evident when banking development is assessed on the basis of the relative volume of commercial bank assets. In these cases the coefficient on finance is an order of magnitude larger in part because the splits occur at higher values of our threshold variable, and in part because property rights are highly responsive to increases in banking development in the high finance regime. For instance, in column (2) of Panel C, the coefficient on finance increases from 0.66 to 7.96 as the percent share of commercial bank assets increases beyond 85 percent of total bank assets. A ten percent increase in this measure will therefore increase a country's rating on the Fraser Institute scale by 0.9 points.

Although the liquid liabilities of the financial sector are strongly correlated with the volume of credit allocated to the private sector (0.85), evidence of thresholds is weaker in this case. Even so the evidence is suggestive. The simulated p-values in our regressions are borderline significant. Moreover, the effect of finance in the high regime increases from zero to positive and significant in all cases but one.

3.4 Conclusion

Existing literature offers evidence suggesting that the cross-country variation in property rights can account for much of the international variation in the development of financial markets. In this chapter I have put forward empirical evidence and produce a rich variety of outcomes and have been able to distinguish between two types of financial development regimes. In a low quality regime the effect of finance on the development of property rights is weak. However, when financial development crosses a certain threshold, further development in finance catalyzes institutional reforms that better secure property.

I examine the relationship between finance and property rights in a cross-section of over 100 countries. The results are consistent with nonlinearities in this relationship. In particular, I find that when the ratio of private credit to GDP is below 32 percent, its association with measures of property rights enforcement is weak. Above this threshold the relationship between these two variables is strong. Further using data on a panel of countries spanning 35 years, I show that the exogenous component in financial development helps predict stronger property rights in countries where credit allocation to the private sector has exceeded the 32 percent threshold.

The results presented in this chapter may also be viewed within the broader context of potential linkages between the real and the financial sector of an economy. Over the past decade a substantial body of research has attempted to identify channels through which financial markets shape growth prospects in countries. There is a general consensus that financial development is conducive to growth because it mobilizes savings for investments, creates an opportunity to pool risks, improves the allocative efficiency,

and lowers transaction costs. In this chapter I point to another, quite different, channel through which financial development may foster economic performance—namely, by creating incentives for countries to strengthen their property rights.

Table 3.1 Within and Between Country Variation in Property Rights

	Overall	Between	Within
Mean	5.96		
Standard Deviation	1.18	0.90	0.73
Minimum	2.30	3.49	3.45
Maximum	9.08	8.58	8.13

Notes: Number of observations = 840, number of countries = 141, average number of observations per country = 5.96.

TABLE 3.2: Results from Threshold Regressions

Threshold Regressions										
Panel A: Average Property Rights, 1970 to 2005. Cross Regime Restrictions										
	(1a)	(1b)	(2a)	(2b)	(3a)	(3b)	(4a)	(4b)	(5a)	(5b)
	Low Regime: Finance ≤ 3.49	High Regime: Finance > 3.49	Low Regime: Finance ≤ 3.6	High Regime: Finance > 3.6	Low Regime: Finance ≤ 3.13	High Regime: Finance > 3.13	Low Regime: Finance ≤ 3.49	High Regime: Finance > 3.49	Low Regime: Finance ≤ 3.49	High Regime: Finance > 3.49
Finance	0.023	1.315***	-0.03	1.545***	0.376	1.945***	-0.552**	1.007***	-0.305	1.087***
	(0.16)	(0.29)	(0.25)	(0.59)	(0.30)	(0.31)	(0.25)	(0.27)	(0.21)	(0.29)
Ethnic Fractionlization	0.002		0.004		-0.002		-0.001		0.004	
	(0.00)		(0.00)		(0.00)		(0.00)		(0.00)	
Latitude	0.042***		0.017		0.047***		0.04***		0.041***	
	(0.01)		(0.01)		(0.01)		(0.01)		(0.01)	
UK Legal Origin	0.572***				0.714***		0.54***		0.6***	
	(0.19)				(0.27)		(0.20)		(0.20)	
Settler Mortality			-0.221*							
			(0.13)							
Catholic Countries					0.077					
					(0.22)					
Constraints on the Executive							2.917***			
							(0.68)			
Income									0.301**	
									(0.13)	
Trade Openness									0.317	
									(0.25)	
Financial Integration									-0.019	
									(0.21)	
Number of Countries in Regime	58	43	43	14	19	48	44	37	52	40
p-value	(0.00)		(0.00)		(0.01)		(0.00)		(0.00)	
Panel B: Average Property Rights, 1970 to 2005. No Cross Regime Restrictions										
	Low Regime: Finance ≤ 3.49	High Regime: Finance > 3.49	Low Regime: Finance ≤ 3.47	High Regime: Finance > 3.47	Low Regime: Finance ≤ 3.49	High Regime: Finance > 3.49	Low Regime: Finance ≤ 3.49	High Regime: Finance > 3.49	Low Regime: Finance ≤ 3.49	High Regime: Finance > 3.49
Finance	0.181	1.097***	0.161	0.72	0.12	1.289***	-0.264	0.681***	-0.009	0.894***
	(0.15)	(0.29)	(0.21)	(0.46)	(0.22)	(0.31)	(0.23)	(0.23)	(0.21)	(0.24)
Number of Countries in Regime	58	43	40	17	32	35	44	37	52	40
p-value	(0.00)		(0.00)		(0.01)		(0.00)		(0.00)	

Notes: standard errors and p-values associated with linearity test reported in parentheses. Statistical significance at 10, 5 and 1 percent marked with *, **, ***, respectively. The dependent variable is the average of the Fraser Institute's property rights rating from 1970 to 2005. Financial development, trade openness and financial integration are averages of each over this sample period. In each case I take a log transformation of those data, except for finance where I take the following alternative transformation: log(1+finance). The log of income and constraints on the executive are the initial 1970 values. All other variables are country-specific. In each regression the log of financial development measure serves as the threshold variable. Estimation was performed in Gauss using a code adapted from Hansen (2000).

TABLE 3.3 :Income as a Threshold Variable

Threshold Regressions								
Dependent Variable: Average Property Rights, 1970 to 2005								
	Income Thresholds				Finance Thresholds			
	Cross Regime Restrictions		Unrestricted		Cross Regime Restrictions		Unrestricted	
	(1a)	(1b)	(2a)	(2b)	(3a)	(3b)	(4a)	(4b)
	Low Regime: Income ≤ 7.08	High Regime: Income > 7.08	Low Regime: Income ≤ 7.84	High Regime: Income > 7.84	Low Regime: Finance ≤ 3.49	High Regime: Finance > 3.49	Low Regime: Finance ≤ 3.49	High Regime: Finance > 3.49
Finance	0.3	1.226***	0.302	1.255***	-0.25	1.146***	0.012	0.952***
	(0.29)	(0.18)	(0.19)	(0.22)	(0.21)	(0.28)	(0.19)	(0.26)
Ethnic Fractionlization	0.001		0.008**	-0.001	0.004		0.004	0
	(0.00)		(0.00)	(0.01)	(0.00)		(0.00)	(0.01)
Latitude	0.035***		0.026	0.037***	0.037***		0.015	0.044***
	(0.01)		(0.02)	(0.01)	(0.01)		(0.01)	(0.01)
UK Legal Origin	0.636***		0.756***	0.611***	0.638***		0.614**	0.8***
	(0.19)		(0.29)	(0.24)	(0.21)		(0.27)	(0.28)
Income	0.555***		-0.37*	0.606**	0.293**		0.083	0.497*
	(0.16)		(0.21)	(0.26)	(0.13)		(0.13)	(0.26)
Number of Countries in Regime	19	73	36	56	44	37	44	37
p-value	(0.00)		(0.01)		(0.00)		(0.00)	

Notes: standard errors and p-values associated with linearity test reported in parentheses. Statistical significance at 10, 5 and 1 percent marked with *, **, ***, respectively. The dependent variable is the average of the Fraser Institute's property rights rating from 1970 to 2005. Financial development is also averaged over the sample period and transformed as follows: log(1+finance). Income is the log of the 1970 value. All other variables are country-specific.

TABLE 3.4 A:Income vs. Finance Thresholds

Dependent Variable: Average Property Rights, 1970 to 2005		
	(1)	(2)
Finance	0.713**	0.031
	(0.28)	(0.19)
Finance * High Finance	0.338***	0.4***
	(0.10)	(0.12)
Finance * High Income	-0.416***	0.011
	(0.15)	(0.13)
Ethnic Fractionlization	0.001	0.004
	(0.00)	(0.00)
Latitude	0.032***	0.038***
	(0.01)	(0.01)
UK Legal Origin	0.631***	0.733***
	(0.21)	(0.24)
Income	0.471**	0.241
	(0.20)	(0.20)
R-squared	0.8157	0.7917

TABLE 3.4 B: Income vs. Finance Thresholds Coefficients on Finance in Various Regimes

	Significance of Coefficients from Column (1)		Significance of Coefficients from Column (2)	
	Low Finance	High Finance	Low Finance	High Finance
Low Income	0.714**	1.052***	0.032	0.432***
	(0.28)	(0.23)	(0.19)	(0.17)
High Income	0.298**	0.636***	0.043	0.444***
	(0.15)	(0.16)	(0.24)	(0.18)

Notes: standard errors and p-values associated with linearity test reported in parentheses. Statistical significance at 10, 5 and 1 percent marked with *, **, ***, respectively. The dependent variable is the average of the Fraser Institute's property rights rating from 1970 to 2005. Financial development is also averaged over the sample period and transformed as follows: log(1+finance). Income is the log of the 1970 value. All other variables are country-specific.

TABLE 3.5: Results from Panel Regressions

Dependent Variable: Property Rights Index, 1970, 1975, 1980, 1985, 1990, 1995, 2000, 2005										
	(1)	(2)	(3a)	(3b)	(4a)	(4b)	(5a)	(5b)	(6a)	(6b)
	Full Sample		Arellano-Bover Regressions Based on Sample Splits							
	Fixed Effects	Arellano-Bover	Low	High	Low	High	Low	High	Low	High
Finance	0.282***	1.044***	0.197	2.032***	-0.386	1.723***	0.026	1.49***	-0.598**	1.416***
	(0.106)	(0.109)	(0.778)	(0.241)	(0.312)	(0.275)	(0.209)	(0.261)	(0.271)	(0.251)
Partisanship					0	0.276*			0.189	0.043
					(0.205)	(0.148)			(0.142)	(0.119)
Income							0.887***	1.704***	1.135***	1.953***
							(0.227)	(0.237)	(0.243)	(0.266)
Trade Openness							0.426	0.316	0.521	0.885
							(0.615)	(0.336)	(0.584)	(0.595)
Financial Integration							0.512**	-0.045	0.377	-0.076
							(0.245)	(0.047)	(0.231)	(0.057)
Number of Countries	116	116	85	68	63	53	64	51	50	40
Number of Observations	644	644	341	303	180	211	263	223	149	167
First Order Serial Correlation		(0.00)	(0.00)	(0.00)	(0.57)	(0.00)	(0.07)	(0.00)	(0.00)	(0.00)
Second Order Serial Correlation		(0.46)	(0.89)	(0.42)	(0.67)	(0.53)	(0.77)	(0.23)	(0.23)	(0.85)
Sargan Test		(0.11)	(0.32)	(0.37)	(0.36)	(0.29)	(0.96)	(1.00)	(1.00)	(1.00)

Notes: The dependent variable is Fraser Institute index of property rights in country i in time period j =1970, 1975, 1980, 1985, 1990, 1995, 2000, 2005. For each, j, finance, partisanship, trade openness and financial integration are averages in the five preceding years, while income is measured in 1965, 1970, 1975, 1980, 1985, 1990, 1995, and 2000. Income is measured in logs and for our measure of financial development I take the alternative transformation log(1+finance).

TABLE 3.6. Threshold Regressions: Robustness to Alternative Measures

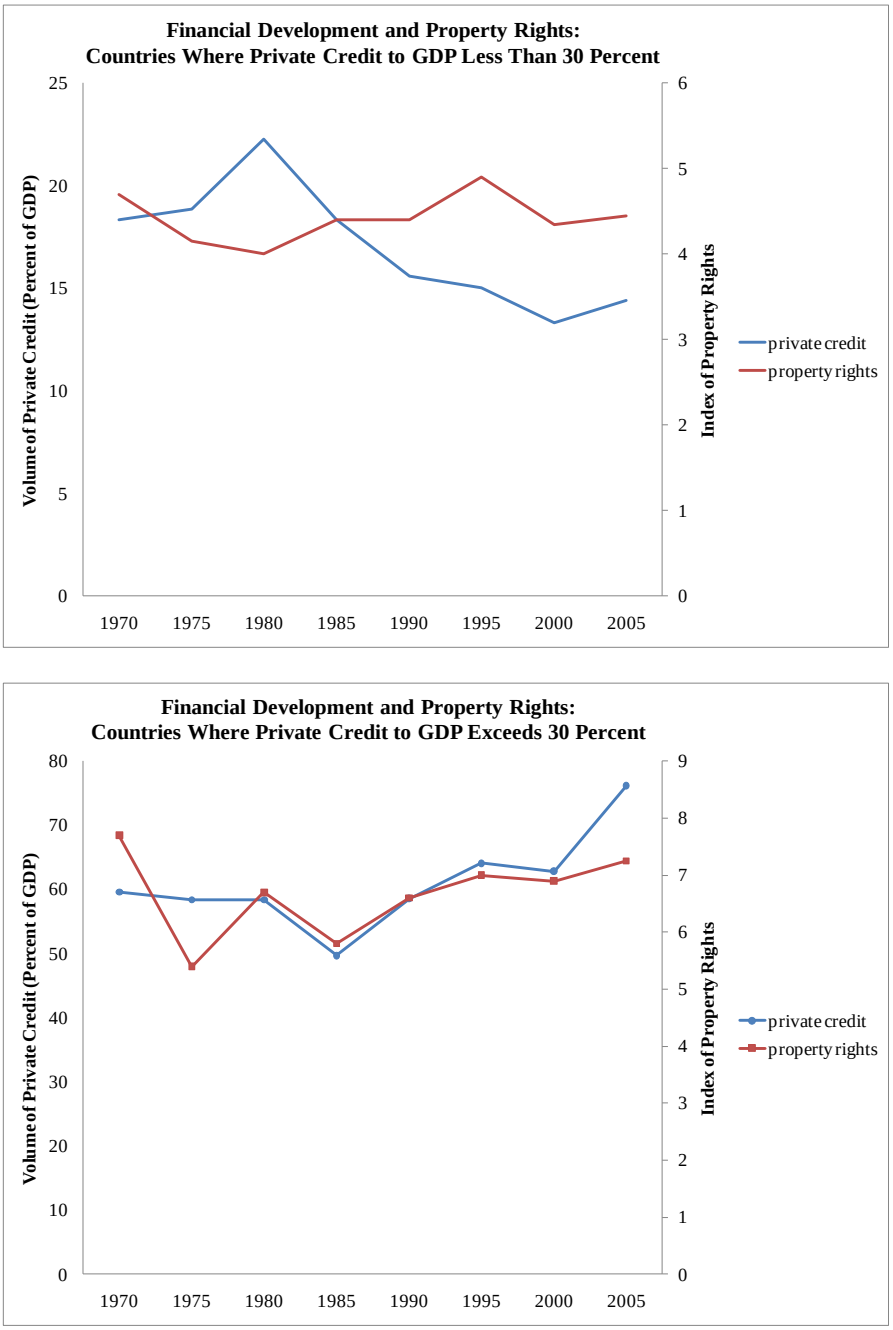
Panel A Measure of Finance: Private Credit to GDP								
	Cross Regime Restrictions				No Cross Regime Restrictions			
	Cato		Heritage Foundation		Cato		Heritage Foundation	
	Low Regime: Finance ≤ 3.34	High Regime: Finance > 3.34	Low Regime: Finance ≤ 3.47	High Regime: Finance > 3.47	Low Regime: Finance ≤ 3.49	High Regime: Finance > 3.49	Low Regime: Finance ≤ 3.47	High Regime: Finance > 3.47
Effect of Finance	0.023	1.315***	0.219	1.038***	0.181	1.097***	0.431	0.800***
	(0.16)	(0.29)	(0.32)	(0.34)	(0.15)	(0.29)	(0.30)	(0.36)
Number of Countries in Regime	58	43	59	46	58	43	59	46
p-value	(0.00)		(0.00)		(0.00)		(0.00)	
Panel B Measure of Finance: Liquid Liabilities to GDP								
	Low Regime: Finance ≤ 3.73	High Regime: Finance > 3.73	Low Regime: Finance ≤ 3.38	High Regime: Finance > 3.38	Low Regime: Finance ≤ 3.73	High Regime: Finance > 3.73	Low Regime: Finance ≤ 3.80	High Regime: Finance > 3.80
Effect of Finance	-0.189	0.996***	1.601***	2.096***	-0.037	0.985**	0.435	1.217***
	(0.34)	(0.33)	(0.55)	(0.36)	(0.34)	(0.38)	(0.49)	(0.39)
Number of Countries in Regime	59	30	34	59	59	30	54	39
p-value	(0.07)		(0.16)		(0.16)		(0.15)	
Panel C Measure of Finance: Commerical Bank Assets / (Sum of Commerical and central Bank Assets)								
	Low Regime: Finance ≤ 4.46	High Regime: Finance > 4.46	Low Regime: Finance ≤ 4.00	High Regime: Finance > 4.00	Low Regime: Finance ≤ 4.46	High Regime: Finance > 4.46	Low Regime: Finance ≤ 4.08	High Regime: Finance > 4.08
Effect of Finance	0.656*	7.959**	0.252	6.500***	0.692*	6.544	0.194	5.823***
	(0.38)	(3.66)	(0.77)	(1.13)	(0.38)	(4.02)	(0.69)	(1.19)
Number of Countries in Regime	61	38	15	88	61	38	18	85
p-value	(0.00)		(0.00)		(0.00)		(0.00)	

Notes: standard errors and p-values associated with linearity test reported in parentheses. Statistical significance at 10, 5 and 1 percent marked with *, **, ***, respectively. The dependent variables are the average value of the Fraser Institute index from 1970 to 2005 and the average of the Heritage Foundation index from 1995 to 2005. The regression specification follows the baseline model, where each of the variables except finance is country-specific. Finance is measured as the log of the private credit to GDP ratio, the log of liquid liabilities to GDP and the log of commercial assets to total bank assets. In each regression the relevant financial development measure serves as the threshold variable. Estimation was performed in Gauss using a code adapted from Hansen (2000).

Table 3.7 Data Appendix

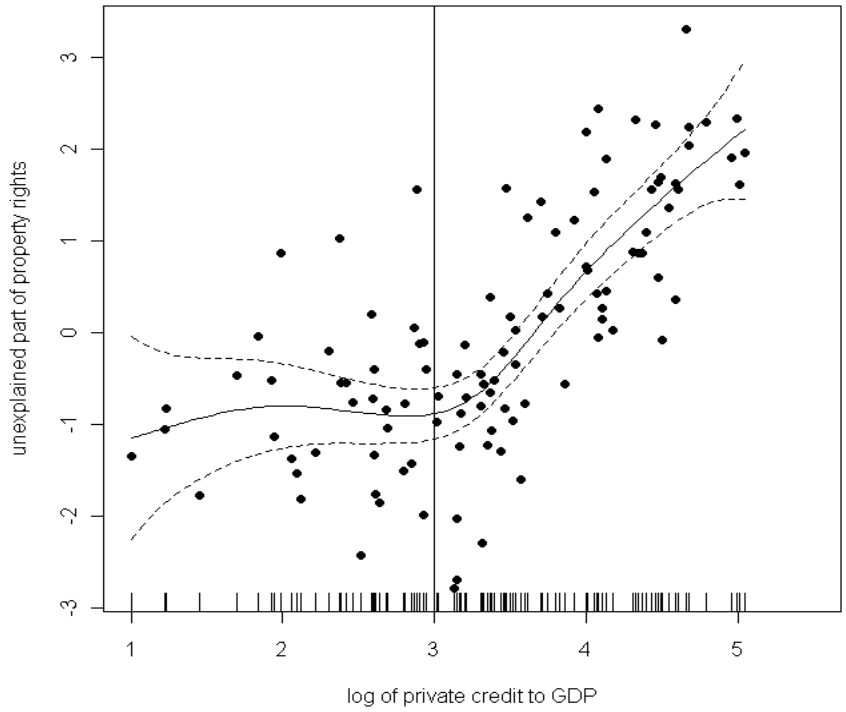
Variable	*Description*
	Measures of Property Rights
Fraser Institute Index	Rating of private property ranging from 0 to 10, higher values indicating stronger property rights. Source: economic Gwartney, J., Hall, J., Lawson, R, (2009). *Freedom of the world: 2009 annual report*, Fraser Institute.
Heritage Foundation Index	Rating of private property ranging from 0 to 100 rescaled to 0 to 10; higher values indicating stronger property rights. Source: the index of economic freedoms: freedom#8, property rights, Heritage Foundation.
	Measures of Financial Development
Private Credit	Credit supplied by financial intermediaries to the private sector divided by nominal GDP at market prices. *Financial structure database*.
Liquid Liabilities	Ratio of broad money to nominal GDP. *Financial structure database*.
Bank Assets	Ratio of commercial bank domestic assets to the sum of commercial and central bank domestic assets. *Financial structure database*.
	Other Explanatory Variables
British Legal Origin	Indicator for English common law tradition. Easterly (2001) original source La Porta et. al., 1999.
Ethnic Fractionalization	Probability that two randomly selected individuals will not speak the same language. Easterly (2001)..
Distance from Equator	Absolute value of the latitude of a country. Easterly (2001).
Mortality Rates	The log of mortality rates within European settlements. Acemoglu et. al. (2001).
Constraints on the Executive	Measures the feasibility of a change in government policy based on the presence of independent branches of government with veto power. These data were drawn from Henisz (2000). And updated from author's web-site.
Religious Identity	Primary religion—Catholicism. CIA world fact book.
Initial Income	Real GDP per capita adjusted for differences in purchasing power (series rgdpl, Penn world tables 6.2).
Trade Openness	Ratio of trade to GDP. *World development indicators* CD Rom (2002).
Financial Integration	Financial integration is calculated as the sum of foreign assets and foreign liabilities divided by GDP, using the External Wealth of Nations Mark II database of Lane and Milesi-Ferreti (2006).

FIGURE 3.1: Evolution of Finance and Property Rights over Time



Notes: Starting in 1970, property rights data taken from the Fraser Institute are measured every five years, while financial development is measured as the average volume of credit allocated to the private sector over the five preceding years, i.e. from 1965-69, 1970-75, and so on. In each case, the chart plots the median value of property rights and financial development.

FIGURE 3.2 : Relationship between Finance and Property Rights (Property Rights are measured as the Average from 1970 to 2005 of the Fraser Institute's Index)



Notes: The plot is of the smooth function in (5) along with the 95% confidence bands. Estimation was performed in R using the mgcv package Wood (2009).

Chapter 4: Effects of collateral law reforms on access to finance

4.1 Introduction

It is well established both in theory and empirics that collateral reduces incidences of credit rationing and facilitates efficient allocation of resources[9]. These benefits are particularly large for developing countries where firms' ability to put up collateral is limited (Liberti and Mian, 2010) and credit markets are plagued with informational frictions (Luoto et al. 2004). A study conducted for World Bank, covering 60 low and middle-income countries in Europe, Central Asia and South Asia for the period 2001-2005, found that 70% percent of all rejected loan applications by firms are due to insufficient collaterals (Fleisig, 2006). The same study reported that nearly 31% of firms in South Asia and 20% in East Asia abstain from applying for a loan in anticipation that their application will not meet lenders' collateral requirements. Naturally, the problem is more acute among the small firms due to their limited ability to provide collaterals (Beck et al 2008, Schiffer & Weder 2001, Fleisig 2002).

In recent years, a number of policies have been put into motion in the low and the middle income countries with the objective of easing credit constraints facing firms in these countries. These reforms have drawn momentum from the facts that private firms in these countries own only 20% of assets in land and buildings which account for nearly 73% of accepted collateral (Fleisig et al. 2006). This is in sharp contrast with the standard procedure followed by lenders in a developed financial market. For example, in the U.S., 50% of credit is secured by movable

[9] Please refer to Coco (2000) for a survey on theoretical literature emphasizing the role of collateral in reducing adverse selection and moral hazard problem in the credit market. Also refer to Steijvers and Voordeckers (2009), Menkhoff et al., (2006), Hernandez-Cananovas and Martinez-Solano (2006), Chakraborty and Hu (2006), Brick and Palia (2007), Lehmann and Neuberger (2001) and Jiménez (2006) for supporting empirical evidence.

properties, and 99% of movable properties that are acceptable as collateral in the U.S. are unacceptable in Nigeria (Affaki 2010).

The aforementioned legal reforms span across many countries and come in various forms including setting up of collateral registries, modernizing existing registries or taking initiatives to unify registries electronically across geographical regions. In other cases, the reforms were intended to reduce transaction costs by relaxing existing stringent collateral laws that require specific description of assets in the security arrangements. In this essay, my focus is on a set of reforms that have allowed for a wider set of assets to be used as collateral. These assets include movable and intangible properties which prior to the reforms were excluded from the list of acceptable collaterals. In particular, I wish to examine the effects of such reforms on firms' perceived access to finance in the twelve low and middle-income countries drawn from Latin America, Eastern Europe, Africa and South Asia that have undergone reforms with the goal of allowing intangible assets such as machinery, inventory, accounts receivables etc. to be used as collateral.

For my analysis, I have drawn data from various sources. For example, I have used the Enterprise Survey dataset published by World Bank to obtain firm-level data on perceived access to finance and other characteristics of firms in 88 low and middle countries over the period 2001-2011. I have combined this information with the information on collateral law reforms drawn from the Doing Business Reports published by World Bank which offers details about changes in business regulations in 185 countries beginning 2004. As additional controls I have used a number of institutional and financial variables which are known to have bearing on firms' access to finance.

The analysis yields a number of policy relevant findings. First, I find that broadening the range of assets that can be used as collateral improves access to finance as perceived by firms. However, these effects are more pronounced in cases where reforms are accompanied or followed by movable collateral registries. This finding offers support to a recent study (Love et al. 2013) which suggests that setting up movable collateral registries generates positive and significant effects on bank loans, credit, over draft facility and interest rates. In addition, I find that the positive effects of collateral reforms on firms' perceived access to finance increase in the firm size. This raises the possibility that the realized benefits of these reforms are misaligned with the main goal of helping smaller firms.

The rest of the chapter is organized as follows. In Section 2, I layout the methodology underlying the analysis. Section 3 describes the data on reform and the variables that I use in the analysis. Section 4 presents the results and Section 5 concludes with some discussions.

4.2 Methodology:

The World Bank Enterprise Survey data is not longitudinal and does not track the same set of firms over the years. This limits the possibility to rely on panel estimations. As an alternative, I estimate the model using a two-way fixed effect linear regression model.[10] This two way fixed effects model is a generalization of the difference in difference models which are a widely used identification strategy in applied econometrics. By using a group of non-reform countries as the treatment group, this model attempts to identify the effects of reforms in the control group of countries by controlling for cross sectional and time series variation. The use of

[10] In the existing literature, following the seminal article by Abowd et al. (1999), the two-way- fixed effect models have been used frequently in various contexts. For example, Abowd et al. (2009) and Woodcock (2008) have used this model to analyze employer-employee data. Whereas, Kramarz et al. (2008) and Bennett (2010) have used the methodology to analyze student-teacher data (and doctor-patient data, respectively. Also, please refer to Mittag (2012) further discussions on estimation procedure.

time series data for untreated (non-reform) countries, I am able to establish what would have happened in the absence of intervention (in this case the collateral law reforms).

In particular, I consider the following specification:

$$Y_{ijt} = \alpha + \beta.\left(Reform_{jt}\right) + \gamma.\, X_{ijt} + \delta.\, Z_{jt} + \mu_j + \theta_t + \varepsilon_{ijt} \qquad (1)$$

Where 'i' indexes firm, 'j' indexes country and 't' indexes the years. Access to finance, which is our dependent variable, is denoted as Y_{ijt}. The set of firm-specific controls are denoted by X_{ijt}. Z_{jt} refers to country-level variables that are likely to influence firms' access to finance. The year fixed effects and the country fixed effects are denoted by θ_t and μ_j respectively. These dummies control for the effect of any common time varying shock to the countries and the effects of time invariant country specific fixed effects.

The idiosyncratic error is denoted as ε_{ijt}. The usual assumption is that the latter is independent and identically distributed which is often violated. A natural generalization is to assume "clustered errors" i.e. that observations within group "i" are correlated in some unknown way, inducing correlation in ε_{ijt} within i. In the present context, to account for the possibility that errors may be correlated across groups (countries), I have corrected the standard errors by using country-level clusters (Bertrand et al 2004). This allows me to account for grouped errors across individual firms. Possibility of errors to be correlated across time is less in this case due to the lack of substantial time variation in our data.

My primary variable of interest is "*Reform,"* which, for country j, takes the value equal to 1 for the reform year and the subsequent years following reform. The coefficient β is my main variable of interest which captures the effect of allowing movables and intangibles as collateral on the perceived access to finance after controlling for firm and country specific controls.

4.3 **Data:**

4.3.1 Data on Reform years:

I draw information about the dates and the details about country level reforms from the World Bank's Doing Business Report. The Doing Business Report is a widely used study conducted by the World Bank on a yearly basis since 2004 that measures the costs to firms of doing business. As of 2012, these reports covers 185 countries and offer detail information about the costs, the requirements, and the procedures that a typical private firm encounters in these countries. The reports also include information on a range of regulatory changes pertaining to starting a business, obtaining construction permits, employing workers, registering property, getting credit, protecting investors, trading across borders, enforcing contracts and closing a business etc. It also includes information on changes in regulations pertaining to the setting up of collateral reforms that are relevant for the present analysis. I use this information to isolate a list of twelve countries that have allowed for movable and intangibles (for instance, machinery, inventory, accounts receivables, etc.) to be used as mortgage during the last decade (2001-2011). The list includes seven Eastern European countries (Bosnia-Herzegovina, Romania, Ukraine, Estonia, Serbia, Montenegro and Croatia), two Latin American countries (Peru, Guatemala), two Asian countries (Laos, Vietnam), and one African country (Rwanda). Table 4.1 provides information on reform details and reform dates for these countries. The nature of the collateral law reforms is different across these 12 countries. All the 12 countries expanded the range of options available in collateral thus allowing for creation of collateral not just in land/buildings/real estate but other movable assets, personal assets, intangibles (inventory and accounts receivables) etc. However Peru, Guatemala, Rwanda and Ukraine also opened collateral

registries in addition to the above mentioned reforms. These registries provide information on collateral registered as well on the existing relationship between borrowers and lenders.

4.3.2 Data on Access to Finance:

The World Bank's Enterprise Survey dataset provides firm-level data on access to finance, which is the dependent variable in equation (1). The Enterprise Survey is a rich and comprehensive data set that provides firm-level data from over 70,000 establishments from 120 countries. The data are collected through personal interviews with business owners, top managers, and accounting officials of manufacturing and service sectors firms. Formal (registered) companies with 5 or more employees were considered for interview and. Also, those firms with 100% government/state ownership were excluded from this process. I extract data from two waves of survey during the period 2002-2011. There is a wide variation in the size of the firms- 65% have less than 50 employees, 20% have 50 to 200 employees and the rest 15% have more than 200 employees.

The Survey covers a wide range of topics related to the business environment, such as, general business characteristics, infrastructure, services, sales, supplies, access to finance, degree of competition, land, crime, business-government relations, investment climate constraints, labor, and productivity. The questions are mostly objective and are aimed at measuring the quality of the business environment. Less than 10% of the questions are subjective (asking the respondent for his or her opinion). The 'access to finance' variable is based on one of such subjective survey questions where firms were asked about their perception regarding the costs (e.g interest costs and fees) and the availability of external finance. The goal of the question is to get an idea about the extent to which availability of external finance poses as an obstacle to the

operations and growth of the firms. The responses were sought on a scale from zero to four where zero indicates no obstacles and four indicates the most severe obstacles faced by firms[11]. In Table 4.2 I present a brief description and the summary statistics on this variable along with other explanatory variables.

4.3.3 Date on other control variables:

I also control for a number of financial, institutional and firm-specific information that are relevant for our analysis. While the Enterprise survey data set remains as the source for the firm-level variables, I use the World Bank's financial structure data base and World Governance Indicators for country-level institutional and financial variables. Here I provide details on some of these variables and the rest of the details are included in the Table 4.3.

The firm-level variable **audit** is a dummy variable that takes value 1 if a firm has its annual financial statement checked and certified by an external auditor and 0 otherwise. I include this control as more transparency is likely to have a positive effect on the access to external finance (Nguyen and Qian 2012). In the Enterprise Survey, the managers were also asked whether or not they have confidence on the **judicial system** of the country when it comes to protecting their property rights. The responses were rated from 1 (Fully Disagree) to 6 (Fully agree). Since the strength of property rights are relevant for the financial development and the availability of credit (La Porta et al 2002, Besley & Ghatak 2009, Beck et al 2005), I include these responses as a control. Finally, the survey also includes a question on the ownership structure of firms. Since, a firm's ownership structure could influence its access to credit

[11] During the first wave of survey, some countries (e.g., Ukraine, Estonia, Bosnia, Croatia and Romania) the responses were measured using scale ranging from 0 to 3. Table 4.5 lists the particular years for which such scale was used. I explicitly consider the implication of this variation in the measurement during our analysis.

(Nguyen & Qian 2012, Love et al 2013), I include **legal status** as an additional control which takes the value 1 if the firm is privately held and zero otherwise.

I recognize that, in addition to firm level characteristics, country-wide factors such as institutional quality and the level of financial development could influence a firm's access to finance. Accordingly, I use the Index of Government Effectiveness from World Governance Indicator Project of the World Bank as a control to capture the quality of legal environment and the quality of institutions. This project reports aggregate and individual governance indicators for 215 economies over the period 1996–2012, and measures the quality of public services, the quality of the civil service and its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to its stated policies. The project ranks Government Effectiveness of countries on a scale -2.5 to 2.5, with higher values indicating better governance.

To capture the level of financial development, I use three measures that are drawn from the World Bank's Financial Structure Database and are widely used in the literature (Beck et al. 2000). The first measure is the ratio of commercial bank assets to the sum of commercial and central bank assets. This measure has been widely used as a proxy for financial development since the pioneering contributions by King and Levine (1993). The second measure is the ratio of liquid liabilities to GDP, which is considered as the broad indicator of financial deepening. Finally, I use the volume of credit supplied by the financial system to the private sector (as a ratio of GDP). In addition, I use the spread between the deposit rate and the lending rate of commercial banks as an indicator for financial development (Hasellman et al 2006, Nguyen and Qian 2012). A higher spread is usually associated with a tighter credit condition (Jimenesz et al 2004). Finally, I include growth rate of real per capita GDP as an additional control (Jimenesz et

al 2004, Love et al 2013, Hasellman et al 2006) to capture any potential effect coming from current macroeconomic condition to the credit market.

4.4 **Results:**

4.4.1 Access to Finance:

I begin by regressing perceived access to finance against the reform dummy. As additional controls I include audit, legal status, judicial system, growth rate of GDP, interest rate spread and government effectiveness. At this stage I do not differentiate between the types of reforms (e.g. the reforms that have allowed intangible collateral versus reforms that have established collateral registries). I report results in column 1 of the Table 4.4 with bank assets as a country-wide proxy for financial development.

The findings suggest that some of the firm-specific characteristics matter for a firm's access to finance. For example, firms that are audited tend to have easier access to finance. Also, private firms have easier access to finance. Similarly, higher growth, higher level of financial development (as measured by bank assets), and lower interest rate spread improve firms' perception about access to finance. There is also evidence that firms view external finance as a lesser obstacle when they give higher ratings to the quality of the judicial system and property rights institutions. Such a relationship, however, is absent in the case of country-wide index measuring government effectiveness. I suspect that this is due to widely discussed weaknesses of the broad government effectiveness index in capturing true institutional qualities

(Kraan,Manning, Malinska 2006).[12] The absence of the result could also be due to strong correlation between the country-wide index and the firm-level 'Judicial System' variable.

Most Notably, after controlling for fixed effects, common time trend and a wide range of factors, the coefficient of the reform dummy is found to be -0.59 and significant at 1% level. This implies that reforms improve firms' perception about access to finance. For further insight, I repeat the baseline regression by including a wider list of financial development indicators, one at a time, and report the relevant coefficients in columns 2 and 3 of Table 4.4. The coefficient reduces in magnitude to -.0.46 and -0.36. But they continue to be significant at 1% and 5% levels. Thus I find that in all these cases the association between the reform and the perceived access to finance remains positive and statistically significant. In the WBES data, there are some isolated cases where access to finance responses were measured by a 0 to 3 scale as opposed to a 0-4 scale that applies in most cases. As a robustness check, I re-run the regressions after dropping some countries and reform years for which this anomaly applies[13]. The coefficients of the reform dummy remains negative and significant. Further, as one might expect the size of the coefficients are now larger than the benchmark results.

4.4.2 Effects of Firms' Sizes:

There is ample evidence to suggest that, in comparison to the larger and the medium size firms, the smaller firms face tighter credit constraints due to their limited ability to provide collaterals. Therefore it is reasonable to form a hypothesis that the benefit of the reforms are unlikely to be uniform across firm sizes and is the smaller firms are likely to benefit most from

[12] Nguyen and Qian (2012) explored the determinants of collateralized borrowing using the same data set and similar set of institutional controls. According to them, effect of country level institutional indicators on intensive margin (collateral value) is muted and have very little effect on collateral value.

[13] I dropped the reform countries Croatia and Romania entirely from the sample. I also removed years 2009 for Bosnia and Estonia, and year 2008 for Ukraine.

the reforms. In this section, I test this hypothesis by running the baseline regression separately for small, medium and large firms. I define small, medium and large firms if the number of permanent employees lies between 0-50, 50-200, and greater than 200, respectively. The results are reported in column 1-3 of the Table 4.6. In all the cases, the coefficients of the reform dummy remain significant and negative implying that the benefit of the reform accrues to firms of all sizes. Interestingly, however, the magnitude of the coefficients increases with firm size[14]. The coefficients increase from -.479 in case of small firms to -0.9 for large firms. The same pattern emerges when I replace bank assets with other measures of financial development. In fact, in the case of the private credit, the effects of reforms become insignificant for small firms. These results render support to other findings (e.g, Lilienfeld-total *et al* 2012) where smaller firms have experienced a contraction in credit and fixed assets, following a reform that strengthened banks' ability to enforce credit contracts. The results also raise a possibility that the effects of reforms may not be aligned with its objective of helping smaller firms. As in the previous section, I re-run the regressions after omitting cases where access to finance responses were measured in a 0-3 scale. As shown in the Table 4.7, the same pattern prevails when I use private credit and liquid liabilities as measures of financial development. In the case of bank assets, the coefficient for medium firms is slightly higher than large firms, but both coefficients are significantly larger than the coefficient for the small firms.

4.4.3 ***Effects of registry reforms:***

In practice, collateral reforms that broaden the range collaterals must meet other criteria to make an impact on firms' access to finance. Among these, the most important one is the presence

[14] As an alternative, also considered an interaction term between the reform dummy and the log of firm size. In tis case the coefficient of interaction term appears insignificant. I suspect that this is due to the discontinuity in the relationship between firm size and the access to finance.

of an arrangement that notifies the parties about the existence of a security interest on an asset. Collateral registries serve this purpose by disseminating information about the existing lien on collaterals to potential lenders. It is already well-established that the presence of collateral registries mitigates information frictions and facilitates loan transactions. For example, in a recent study covering 73 countries Love et al (2013)) found that setting up movable collateral registries have positive and significant effects on bank loans, credit, over draft facility and interest rates.

In this section, I examine how the effects of collateral reforms vary in the presence and in the absence of movable collateral registries. For this purpose, I split the sample of reform countries into two groups. In the first group, broadening of the assets base were not accompanied or followed by collateral registries (e.g. in Estonia, Croatia, Bosnia, Serbia, Montenegro, Romania, Vietnam). Whereas in the second group, the reforms were accompanied or immediately followed by establishment of collateral registries. (e.g., in Laos, Ukraine, Peru, Rwanda, Guatemala). I estimate the baseline regression separately for these two groups and report the results in table 3.8. The findings are significantly different across the two groups.

For example, the results in Columns 1 and 2 show that after controlling for banks assets, coefficient of reform dummy are negative and significant for those countries that did set up movable collateral registries. For those who did not, the coefficient on reform dummy is insignificant. These results are robust to the changes in the measure of financial development (i.e., from bank asset to liquid liabilities and private credit). As before I re-run the regression (Table 4.9) after making necessary adjustment in the data due to the variation in the response scale. Although the results become less striking compared to the full sample case, the coefficients of the reform dummy appear much larger for those with collateral registries when

bank assets and liquid liabilities are used as a proxy for financial development. In the case of private credit, the results are in tune with those presented in the Table 4.8.

The above results are not surprising. While broadening the collateral base helps the borrowers, registries play a significant role in allowing lenders to more accurately evaluate risks, thus avoiding adverse selection. This reduces the information asymmetry between borrowers and lenders, thus ensuring more accurate risk assessment and eventually expanding access to finance. While broadening the range of assets that can be used as collateral increases the capital available for borrowers, prevalence of registries expedites the financing process since lenders can now assess the credit worthiness of borrowers with greater objectivity. This finding is well-supported by other findings in the literature suggesting that the quality of information has bearing on the cost and availability of credit (Love and Mylenko 2005, Brown et al 2009).

4.5 **Conclusion:**

Using firm-level survey data, this chapter offers evidence that reforms whose objective is to enable the use of hitherto unused movable and intangible assets as collateral have a significant and positive effect on firms' perception towards access to finance. However, such effect is more pronounced in countries where collateral reforms are accompanied by collateral registries for movable assets. In addition, the results suggest that the effects of reform vary with firm sizes with smaller firms benefiting the least. Thus the chapter provides evidence that the effects of reforms could be misaligned with its main goal of helping smaller firms.

TABLE 4.1: LIST OF REFORM YEARS

Country	Asset Reform*	Registry reform
Bosnia and Herzegovina	2004	
Croatia	2006	
Estonia	2003	
Vietnam	2006	
Serbia	2004	
Montenegro	2004	
Romania	2009	
Peru	2006	2007
Rwanda	2009	2009
Guatemala	2008	2009
Ukraine	2004	2004
Laos	2005	2005

*Asset reform refers to countries broadening the range of assets that can be allowed as collateral including movables and intangibles (Ex: Machinery, Inventory, Accounts receivables etc.).

Source: Doing Business Reports, World Bank 2004-2012

TABLE 4.2: SUMMARY STATISTICS

Variable	Number of observations	Mean	Std. Dev
Access to finance	129625	1.386716	1.384289
Bank Assets	78014	0.881683	0.146082
Liquid Liabilities	73011	0.46051	0.250821
Private Credit	73191	0.368895	0.292412
Interest rate spread	107212	-8.51739	7.963535
Growth rate of GDP	137736	3.731377	4.337658
Government Effectiveness Index	139677	-0.18135	0.659227
Audit	137913	0.507653	0.503887
Judicial System	112202	0.468601	0.499015
Legal Status	117322	0.853156	1.281948

TABLE 4.3: DATA APPENDIX

Country Specific Explanatory Variables

Growth Rate: Growth rate of real per capita GDP; Source: World development Indicator

Spread: Commercial Bank Deposit rate -Lending rate: Source: Financial Structure Data Base

Private credit: Private credit by deposit money banks and other financial institutions as a percent of GDP; Source: Financial Structure Data Base

Bank assets: Ratio of deposit money bank assets to the sum of deposit money bank assets and central bank assets; Source: Financial Structure Data Base

Liquid liabilities: Liquid liabilities as a percentage of GDP; Source: Financial Structure Data Base

Government effectiveness : Government effectiveness index: captures quality of public services, the civil service and the degree of its independence from political pressures; Source: World Governance Indicator Project

Firm Specific Explanatory Variables (Source: Enterprise Survey Data Base, World Bank)

Judicial System: Whether managers have confidence in **judicial system** of the country when it comes to protecting their property rights Index (1=Fully Disagree to 6 =Fully agree).

Legal status: Current legal status of firm Index (1=Private firm, 0=Otherwise)

Audit: Does establishment have its annual financial statement reviewed by an external auditor Index (1=Yes, 0=No)

Dependent Variable

Access to Finance: Is access to finance (interest cost, fees, collateral requirements) an obstacle for operation and growth? [Index: 0=No Obstacle, 1=Minor Obstacle, 2=Moderate Obstacle, 3=Major Obstacle, 4=Very Severe Obstacle, Source: Enterprise Survey Data Base, World Bank]

TABLE 4.4 (All reforms that broaden the range of collaterals)

	Column 1	Column 2	Column 3
Reform	-0.5905405***	-0.4597301***	-0.35707**
	(0.2064688)	(0.1571912)	(0.153763)
Growth Rate	0.0054799	-0.0619213	-0.05322
	(0.0147491)	(0.0381586)	(0.033631)
Spread	0.0495558**	0.0564563**	0.041197
	(0.0228007)	(0.0255032)	(0.026877)
Audit	-0.1605669***	-0.1714065***	-0.17076***
	(0.0354899)	(0.0328005)	(0.032679)
Judicial System	-0.2137367***	-0.2134632***	-0.21352***
	0.0280231	0.0311452	0.031196
Legal status	-0.0221522*	-0.0271717**	-0.0286**
	0.0124339	0.0129239	0.012992
Govt Effectiveness	1.081896***	0.8175117**	1.104215***
	0.2815831	0.3479874	0.321697
Bank assets	-3.042836***		
	1.007057		
Liquid liabilities		-3.414755**	
		1.324107	
Private credit			-1.69811*
			0.855627
R Square	0.1146	0.1216	0.1213
N	27021	23916	23916

Notes: standard errors are reported in parentheses. Statistical significance at 10, 5 and 1 percent marked with *, **, *** respectively. Dependent variable in al regressions is access to finance rated from 0 to 4. Coefficients of time, country dummy and constant terms are not reported.

TABLE 4.5 (Countries with access to finance rated from 0-3)

Country	Year of Reform	Index of access to finance (Pre reform years)	Index of access to finance (Post reform years)
Estonia	2003	2002 (0-3)	2005 (0-3), 2009 (0-4)
Bosnia	2004	2002 (0-3)	2005 (0-3), 2009 (0-4)
Ukraine	2004	2002(0-3)	2005 (0-3), 2008 (0-4)
Croatia	2006	2002, 2005 (0-3)	2007 (0-4)
Romania	2009	2005 (0-3)	2009(0-4)

TABLE 4.6: All reforms that broaden the range of assets of collateral, allowing for firm size variation

	Column 1	Column 2	Column 3	Column 4	Column 5	Column 6	Column 7	Column 8	Column 9
	Small	Medium	Large	Small	Medium	Large	Small	Medium	Large
Reform	-0.479**	-0.690*	-0.905***	-0.354**	-0.528**	-0.764***	-0.259	-0.417*	-0.537**
	(0.203)	(0.357)	(0.265)	(0.161)	(0.243)	(0.269)	(0.168)	(0.241)	(0.233)
Growth Rate	0.006	-0.001	0.023	-0.029	-0.103**	-0.092**	-0.020	-0.093**	-0.077*
	(0.013)	(0.019)	0.016	(0.040)	(0.045)	(0.045)	(0.036)	(0.042)	(0.039)
Spread	0.038	0.065*	0.080**	0.041	0.064	0.072*	0.025	0.049	0.056
	(0.023)	(0.035)	(0.035)	(0.027)	(0.040)	(0.040)	(0.027)	(0.045)	(0.047)
Audit	-0.134***	-0.047	-0.155**	-0.129***	-0.070	-0.168**	-0.128***	-0.069	-0.163**
	(0.032)	(0.058)	(0.058)	(0.032)	(0.062)	(0.064)	(0.032)	(0.061)	(0.064)
Judicial system	-0.225***	-0.166***	-0.146**	-0.227***	-0.158***	-0.137**	-0.227***	-0.158***	-0.136**
	(0.036)	(0.041)	(0.057)	(0.039)	(0.036)	(0.054)	(0.039)	(0.036)	(0.055)
Legal Status	-0.030*	0.000	0.019	-0.038**	-0.018	0.028	-0.040**	-0.018	0.026
	(0.015)	(0.022)	(0.021)	(0.015)	(0.022)	(0.024)	(0.015)	(0.022)	(0.024)
Govt Effectiveness	1.006***	0.664	1.855***	0.578	0.755	2.192***	0.842**	1.009*	2.422***
	(0.303)	(0.420)	(0.291)	(0.358)	(0.510)	(0.582)	(0.324)	(0.499)	(0.635)
Bank Assets	-2.666**	-3.253**	-4.076***						
	(1.130)	(1.307)	(0.952)						
Liquid Liabilities				-3.149*	-3.272*	-4.640***			
				(1.576)	(1.825)	(1.585)			
Private Credit							-1.978**	-1.591	-1.101
							(0.868)	(1.214)	(1.118)
R Square	0.1168	0.1372	0.1294	0.1176	0.1501	0.1469	0.1178	0.1498	0.1455
N	17359	5679	3983	15606	5004	3306	15606	5004	3306

Notes: standard errors are reported in parentheses. Statistical significance at 10, 5 and 1 percent marked with *, **, *** respectively. Dependent variable in al regressions is access to finance rated from 0 to 4. Small, medium and large refers to firm sizes. Their shares are approximately 60%, 30% and 10% . Coefficients of time, country dummy and constant terms are not reported.

TABLE 4.7: All reforms that broaden the range of assets of collateral, allowing for firm size variation
Results shown after adjustments made for countries where access to finance rated from 0-3

	Column 1	Column 2	Column 3	Column 4	Column 5	Column 6	Column 7	Column 8	Column 9
	Small	Medium	Large	Small	Medium	Large	Small	Medium	Large
Reform	-0.751***	-1.392***	-1.377***	-0.615**	-1.132***	-1.215***	-0.561*	-1.114***	-1.136**
	(0.166)	(0.412)	(0.395)	(0.257)	(0.365)	(0.496)	0.314	(0.375)	(0.472)
Growth Rate	0.002	-0.006	0.014	-0.061	-0.161**	-0.150**	-0.034	-0.124**	-0.090
	(0.012)	(0.015)	(0.012)	(0.062)	(0.067)	(0.061)	(0.054)	(0.053)	(0.058)
Spread	0.017	0.007	0.021	0.017	0.007	0.006	-0.003	-0.015	-0.030
	(0.033)	(0.025)	(0.042)	(0.039)	(0.042)	(0.064)	(0.029)	(0.037)	(0.066)
Audit	-0.140***	-0.047	-0.150**	-0.137***	-0.071	-0.156**	-0.137***	-0.072	-0.153**
	(0.033)	(0.061)	(0.062)	(0.033)	(0.068)	(0.072)	(0.033)	(0.067)	(0.071)
Judicial System	-0.222***	-0.164***	-0.131**	-0.224***	-0.150***	-0.106**	-0.224***	-0.150***	-0.104*
	(0.038)	(0.042)	(0.058)	(0.042)	(0.034)	(0.052)	(0.042)	(0.034)	(0.052)
Legal Status	-0.029*	0.004	0.025	-0.035**	-0.009	0.041	-0.035**	-0.010	0.040
	(0.015)	(0.024)	(0.022)	(0.016)	(0.025)	(0.025)	(0.016)	(0.025)	(0.026)
Govt Effectiveness	0.992***	0.509	1.646***	0.661*	0.902*	2.363***	0.879***	1.076**	2.425***
	(0.322)	(0.485)	(0.394)	(0.366)	(0.491)	(0.594)	(0.298)	(0.481)	(0.613)
Bank Assets	-2.562*	-2.603*	-3.453***						
	(1.292)	(1.452)	(1.142)						
Liquid Liabilities				-3.100	-3.026*	-4.845**			
				(2.024)	(1.734)	(1.915)			
Private Credit							-1.753*	-0.946	-0.648
							(1.006)	(1.037)	(1.165)
R Square	0.119	0.143	0.132	0.121	0.159	0.143	0.121	0.159	0.152
N	16641	5417	3796	14530	4614	3052	14530	4614	3052

Notes: standard errors are reported in parentheses. Statistical significance at 10, 5 and 1 percent marked with *, **, *** respectively. Coefficients of time, country dummy and constant terms are not reported.

TABLE 4.8: Comparison between countries with and without registry reforms

Dependent variable in all regressions is access to finance rated from 0 to 4.

	Column 1 Registry	Column 2 No Registry	Column 3 Registry	Column 4 No Registry	Column 5 Registry	Column 6 No Registry
Reform	-1.157232***	-0.2059084	-1.320104***	-0.1036104	-1.506299***	0.1184464
	(0.22548)	(0.24898)	(0.22890)	(0.11406)	(0.26761)	(0.08352)
Growth Rate	0.0026659	0.0061405	-0.0747666	-0.0505459	-0.027646	-0.0301768
	(0.01103)	(0.01231)	(0.05583)	(0.03867)	(0.05469)	(0.03572)
Spread	-0.000722	0.0108528	-0.0043797	-0.0002926	-0.0389867**	-0.0364339***
	(0.03085)	(0.02711)	(0.02625)	(0.01553)	(0.01695)	(0.01318)
Audit	-0.1653478***	-0.1669229***	-0.177713***	-0.1792511***	-0.1785355***	-0.1772756***
	(0.03734)	(0.03657)	(0.03432)	(0.03336)	(0.03426)	(0.03315)
Judicial System	-0.2104273***	-0.2165384***	-0.205844***	-0.2163867***	-0.2056638***	-0.215884***
	(0.02930)	(0.02961)	(0.03271)	(0.03284)	(0.03276)	(0.03296)
Legal Status	-0.01864	-0.01848	-0.019922	-0.0214351	-0.0202433	-0.0221177
	(0.01322)	(0.01292)	(0.01442)	(0.01325	(0.01455)	(0.01329)
Govt Effectiveness	0.8571447***	0.783192***	0.5137393	0.407715	0.6999543**	0.6938467***
	(0.30941)	(0.28610)	(0.33758)	(0.29398	(0.27505)	(0.21951)
Bank Assets	-2.346202*	-2.136734*				
	(1.18520)	(1.08939)				
Liquid Liabilities			-4.190923**	-4.560745***		
			(1.62785)	(1.14228)		
Private Credit					-2.657105***	-3.008883***
					(0.97171)	(0.76944)
R Square	0.1145	0.1215	0.1237	0.1313	0.1238	0.1316
N	25539	25069	21881	21964	21881	21964

Notes: standard errors are reported in parentheses. Statistical significance at 10, 5 and 1 percent marked with *, **, *** respectively. Dependent variable in al regressions is access to finance rated from 0 to 4. Coefficients of time, country dummy and constant terms are not reported.

All the countries have broadened the range of assets that can be used as collateral including movables and intangibles. Columns 1,3 and 5 include countries who have additionally opened up movable collateral registries, whereas columns 2, 4 and 6 include countries who have not .

TABLE 4.9: Comparison between countries with and without registry reforms

Dependent variable in all regressions is access to finance rated from 0 to 3.

	Column 1	Column 2	Column 3	Column 4	Column 5	Column 6
	Registry	No Registry	Registry	No Registry	Registry	No Registry
Reform	-1.157232***	-0.6153103***	-1.320104***	-0.3114887*	-1.506299***	-0.0630453
	(0.2255)	(0.1396)	(0.2289)	(0.1761)	(0.2676)	(0.2515)
Growth Rate	0.0026659	0.0012096	-0.0747666	-0.120302	-0.027646	-0.05413
	(0.0110)	(0.0116)	(0.0558)	(0.0611)	(0.0547)	(0.0620)
Spread	-0.000722	-0.0026843	-0.0043797	-0.0009409	-0.0389867**	-0.0406707**
	(0.0309)	(0.0317)	(0.0263)	(0.0276)	(0.0170)	(0.0179)
Audit	-0.1653478***	-0.1726278***	-0.177713***	-0.1870579***	-0.1785355***	-0.1878992***
	(0.0373)	(0.0384)	(0.0343)	(0.0342)	(0.0343)	(0.0343)
Judicial System	-0.2104273***	-0.2129281***	-0.205844***	-0.2099667***	-0.2056638***	-0.2088898***
	(0.0293)	(0.0308)	(0.0327)	(0.0344)	(0.0328)	(0.0346)
Legal Status	-0.01864	-0.0188878	-0.019922	-0.0199631	-0.0202433	-0.0201682
	(0.0132)	(0.0136)	(0.0144)	(0.0148)	(0.0146)	(0.0148)
Govt Effectiveness	0.8571447***	0.8373018***	0.5137393	0.6094859*	0.6999543**	0.8037627***
	(0.3094)	(0.2954)	(0.3376)	(0.3356)	(0.2751)	(0.2600)
Bank Assets	-2.346202*	-2.221588*				
	(1.1852)	(1.1597)				
Liquid Liabilities			-4.190923**	-4.984427***		
			(1.6279)	(1.6939)		
Private Credit					-2.657105***	-2.768359**
					(0.9717)	(1.0856)
R Square	0.1145	0.1239	0.1237	0.1362	0.1238	0.1359
N	25539	23902	21881	20244	21881	20244

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