Finance and Property Rights: Exploring Other Directions

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Abstract

There is a consensus that the extent to which countries enforce property rights can account for the cross-country pattern in the development of financial markets. This paper offers theory and empirics suggesting that financial development can also catalyze property rights reforms. We study this relationship in a model where agents can secure property at a cost. However, strong property rights allow agents to post collateral against loans, thus bettering their terms. In this framework we study the trade-off between the costs and benefits of securing property along the path of financial development. The key implication is that beyond a threshold financial development encourages stronger property rights. We provide evidence of threshold effects in the cross-country relationship between property rights and finance that are consistent with our theory. Additionally, in a panel of countries, we 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.

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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 we 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 paper 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 we build on this basic idea; we 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 we 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.

We 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.[1] On the flip side, in addition to the obvious gains, protecting property offers non-trivial benefits whose source lies in

[1] We recognize that costs of enforcing property right could also take more subtle forms, such as a misallocation of talent from productive to unproductive sectors (Acemoglu and Verdier, 1998), or an increase in market concentration (Furukawa 2007). To keep our analysis streamlined and tractable, here we focus on the direct costs associated with guarding property.

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, we 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, we exploit the above micro foundations to draw conclusions at the aggregate level. In doing so, we do not simply aggregate individuals' behaviors, taking decision parameters, such as the cost of enforcing property rights as given. Instead we 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.

Our theory produces 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. 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 1 we chart an index of property rights (taken from Gwartney and Lawson, 2009) over five-year intervals from 1970 to 2005 along with the average volume of private credit to GDP in the five preceding years. We 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, we 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 co-move. In the high finance group, however from 1980, changes in property rights closely track increases in the volume of

credit to GDP ratios.[2]

Below we provide a more formal test of the predictions of our theory. We begin by examining the evidence on nonlinearities in the relationship between property rights and finance. In particular, we 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, we 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. Our panel GMM analysis confirms our 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 paper is organized as follows. In section two, we present in detail our 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, describes our data and briefly outlines our empirical methodology. In section four, we present our results. Finally section five concludes with some remarks.

2. Theoretical Framework

The Environment

In our 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. We 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

[2] Between 1970 and 1975 the median rating on property rights fell by over 2 points. This drop reflects a change in composition of countries within the data; the sample of countries for which data are available in 1970 is composed of mainly advanced countries, where property is generally well protected, by 1975 data had become available for a large number of developing countries also. Hence the median level of property rights fell between 1970 and 1975 simply because of an improvement in cross-country coverage.

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. We assume that each agent faces an *ex-ante* probability $\lambda \in (0,1)$ of being an owner of a type-L project[3] 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. We assume that these banks operate in a competitive environment and 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, it will become apparent that some loan applicants may be adversely selected and denied credit. In that event, we assume that these agents can scale down the size of their business ventures and produce a *small* amount of output using only (their own) labor as an input in the production process. [4] This outside opportunity generates α_H and α_L units of output to owners of Type-H and Type-L projects, respectively, where $\alpha_L > \alpha_H$. For notational convenience we normalize α_H to zero.[5]

In our 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.

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[3] Alternatively we 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, we take a short-cut by assuming that projects with different risk characteristics are randomly allocated across individuals.

[4] 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.

[5] Strictly, it is only necessary to assume that outside opportunities available to owners of varying project types differ. There are various ways to motivate this. For example, as before, it is possible to interpret this difference as a result of skill heterogeneity: individuals with higher skills can not only generate higher expected project returns, but the value of their outside opportunity is also greater.

Though property rights are slack, we assume that an owner of property can protect a fraction, γ, of her initial endowment and the associated income stream from predation by incurring a monetary and/or time cost in the amount of $\tau\gamma$. In practice, this cost can take various forms, such as the cost of litigating, the costs of monitoring possible infringement, the costs of hiring private security, or lobbying costs incurred when establishing new case law that strengthens property rights (Eicher and Garcia-Penalosa, 2008; Lanjouw and Schankerman, 2001). In addition, we 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 services that protect property increases the price paid for those services (e.g. legal services). To justify this assumption further, we 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[6]. 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[7] 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. In part this reflects a rise in the number of litigations, but it is also a reflection of a steady increase in the average cost of litigating in the US.[8]

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, 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

[6] For details, please refer to 229th Report of the Law Commission of India.
[7] 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).
[8] The percent increase in litigation cases has varied between 30 and 150 percent (Motivans, 2008).

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, we 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.

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.

We suppose that banks incur a cost when contracting loan agreements. We 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. We 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, we 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. We 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.

Recall that the project-type associated with any given loan applicant is private information. In response, financial intermediaries exploit differences across project owners when designing a menu of contracts that induces self-selection. In particular, we assume that the menu of contracts 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.[9] 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 $p_L =$

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

1. Throughout our analysis, we assume that there is risk associated with lending and therefore the condition $\gamma\hat{z} < xr + \delta$ must hold. This, in turn, implies that $R_L < R_H$ and π_L strictly less than one.

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 type-H borrowers from their first best in order to induce self selection. Hence type-H borrowers receive their first best contract: $C_H^F \equiv \left\{R_H = \left[\frac{xr+\delta-(1-p_H)\gamma\hat{z}}{p_H x}\right]; \pi_H = 1\right\}$. The contract for the type- L group is then determined by solving the following problem:

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

subject to the incentive compatibility constraint:

$$p_H(Q - R_H)x \geq \pi_L p_H(Q - R_L) \qquad (2a)$$

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 we 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.

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

Our analysis in the previous section traces a link between financial contracts and the value of γ, i.e. the extent to which individuals 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 dra*w she* will receive from this distribution *ex post*. Accordingly, the agent's problem is to maximize the following objective function:

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

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, $\widetilde{U_L} = \pi_L[(Q-R_L)x + \gamma\widehat{z}] + (1-\pi_L)(\gamma\hat{z} + \alpha_L)$. 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 we 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 we 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.

Endogenous τ and Economy wide Outcomes

The results obtained above characterize 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 paper, we 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, we treat the cost of enforcing property rights as an endogenous outcome dictated by the aggregate behavior of individuals. In particular, we postulate that the marginal cost of protecting property, τ, increases with the number of people protecting their property. Formally, we 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: We 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 $\tau_1 > \tau_0$, we have $\delta_c > \delta_1$ (Refer to Figure 2).

Suppose that $\delta > \delta_c$, and consider a behavior profile where all agents set $\gamma = \gamma_{min}$. Accordingly, $\tau = \tau_0$. Since, $\frac{\partial \Omega}{\partial \delta} < 0$ and by definition $\Omega(\delta_c) \equiv \tau_0$, it follows that $\Omega(\delta) < \tau_0$ for $\delta > \delta_c$. Therefore, following 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 that 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.

The central testable implication of our model is a nonlinear relationship between financial development and property rights. In particular, economies must cross a threshold level of finance before further developments in the financial sector can create incentives to strengthen property rights. Below we provide evidence on the relationship between measures of financial development and property rights which are broadly consistent with these predictions.

3. Data and Methods

Outline of the Methodology

The purpose of this section is to provide a brief outline of the approaches we take for testing the implications of our theory. A discussion of the sources and dimensions of our data, as well as the factors dictating the choices of specifications, is deferred until later.

The first set of evidence we present tests for threshold effects in the finance-property rights relationship. Our 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, we estimate variations of the following regression:

$$\pi_i = \varphi_i\theta_1[I(\varphi_i \leq \tau)] + \varphi_i\theta_2[1 - I(\varphi_i \leq \tau)] + u_i. \qquad (4)$$

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 we can make structural inferences. The difficulty is that financial development is endogenous. In addressing this issue we face two hurdles. First, instrumental variables estimation within endogenous threshold models is difficult. Estimation methods are available only with certain restrictions (see Caner and Hansen, 2004 for details). The second difficulty relates to identifying instruments that capture the exogenous cross-country variation in financial institutions.

Here we present a second set of evidence where we take an alternative approach. We attempt to resolve the issue of identification within a panel framework using the Arellano-Bover system GMM estimator. Panel data methods are not a panacea for resolving identification issues. However since finding exogenous sources of variation in the cross-section is difficult, dealing with identification in a panel framework may be the only viable approach. Moreover, panel regression offers other advantages over cross-section; most importantly it allows us to control for country-specific effects.

We link our panel analysis to our earlier analysis of thresholds, by splitting our data into

two sub-samples based on our previously generated threshold estimates. Thus we 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 $\varphi_{i,j} > \hat{\tau}$. Our 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 $\varphi_{i,j} > \hat{\tau}$, we would expect to isolate a strong positive relationship between financial development and property rights within countries over time.

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 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 we 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, we 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).

4. Results

An Initial Look at the Data

In this section, we provide evidence on the relation between finance and property rights. We present this in stages. We begin by regressing property rights against the *logarithm* of finance[10] and a set of other controls. We do not fully parameterize this relationship. Instead we 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:[11]

$$\pi_i = s(\varphi_i) + x'_i\beta + u_i, \qquad (5)$$

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 we 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 our baseline model and with the exception of a dummy for Catholicism, which we 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.

[10] 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.

[11] The smoother $s(\varphi)$ was estimated using a penalized spline regression in R using the mgcv package (see Wood, 2009 for details). P-splines are a hybrid of regression splines and smoothing splines, where the nonparametric smoothers, $s(\varphi)$, are approximated using basis expansions of $s(\varphi)$, with fewer knots than the number of observations, but more than would be the case with regression splines.

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 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 we 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 (5) 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 we are 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. 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 our 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 we present evidence which formally tests for the presence of threshold effects in

the relationship between finance and property rights.

Threshold Regressions

In this section we apply methods developed in Hansen (1996; 2000), to split our data into two groups, based on our measure of financial development. To this end we augment and then estimate equation (4), using additional regressors, beginning with our baseline specification. We then extend this baseline in various ways. First, we 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, we 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 our third specification, we 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 we introduce a control for constraints on the executive.

Finally, we consider the role of economic influences on property rights, by extending our 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. A complete list of the variables in our models, along with sources for our data, is provided in the Data Appendix.

We estimate two versions of equation (4). First we estimate the following model:

$$\pi_i = \varphi_i\theta_1[I(\varphi_i \leq \tau)] + \varphi_i\theta_2[1 - I(\varphi_i \leq \tau)] + x_i'\beta + u_i, \qquad (6a)$$

i.e. we augment (4) 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 we 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 our estimates of θ_1 and θ_2 which may (erroneously) lead to the rejection of the null hypothesis: $\theta_1 = \theta_2$. Thus, in addition to the restricted model (6a), we also consider the case where the model parameters on each of our controls is allowed to vary freely across regimes, i.e. we estimate the following specification:

$$\pi_i = \left(\varphi_i\theta_1 + x_i'\beta_1\right)[I(\varphi_i \le \tau)] + \left(\varphi_i\theta_2 + x_i'\beta_2\right)[1 - I(\varphi_i \le \tau)] + u_i. \quad (6b)$$

The results from these exercises are arranged across two panels in Table 2. The dependent variable is the average of the Fraser Institute index from 1970 to 2005. In Panel A, we allow the coefficient on the intercept and finance variables *only* to change across regimes, i.e. we impose cross-regime restrictions on our additional controls. In Panel B, we estimate a model without imposing cross-regime restrictions. To save space, in Panel B we only report the coefficients on the finance variable.

We find strong evidence in favor of a split (based on finance) in every model specification when we impose cross-regime restrictions on our other model parameters (Table 2, Panel A). In each case, we 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 our 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.

Our results are qualitatively similar when we 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 we control for European settler mortality rates, which significantly shrinks our sample.

The coefficients on some of our other control variables are consistent with earlier research. For instance we 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 0.71 points higher on the 10-point Fraser scale (Table 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 we 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 our estimates, we can attribute about a third of this difference to the variation in settler mortality rates. The effect of political constraints is also quantitatively more important. On average, countries with the strongest constraints on their chief executives (in our sample these countries generally received a score of approximately 0.5, except Belgium which received a score of 0.65) received a score approximately 1.6 points higher on the Fraser index.

We find also that higher incomes and increased trade openness are associated with stronger enforcement of property rights (Table 2, Panel A, column 5b), although the effect of trade openness is not statistically significant. Increased financial integration by contrast is associated with weaker property rights, which is the opposite of what we might expect, although this effect is insignificant.

Despite some range of variation in the magnitude of the effect of finance on property rights, at first blush our findings are consistent with the predictions of our theory. However, importantly a “kink” in the finance-property rights relationship is not by itself direct evidence in support of our theory, as within each regime the direction of causality could be running from property rights to stronger financial market development.

Panel Regressions

Since it is difficult to isolate the structural component in the relationship between property rights and finance in the cross-section, we attempt to generate some traction on this issue by exploiting the time-series variation in the Fraser Institute's data. In particular, we re-estimate the property rights-finance relationship in a panel, using as instruments, lags of the endogenous regressors. We use the system-GMM estimator (Arellano and Bover, 1995; Blundell and Bond, 1998) which is particularly well suited for confronting the issue of endogeneity when variables exhibit a large degree of persistence—a characteristic often found in macro panels. We report results based on the one-step variant of this estimator, since the standard errors in the two-step estimator tend to be downward biased in finite samples.

Our property rights equation no longer includes country-specific effects. Hence our 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, we extend this specification by including controls for initial period real per-capita income, trade and financial openness. Since our goal is to examine how the effect of finance on property rights changes across regimes, we split our data into two subsamples using our earlier threshold estimate (private credit ≈ 32 percent of GDP)[12] and estimate the relationship between property rights and finance within each subsample.

As a benchmark we 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, column 1). Thus while institutional change sometimes occurs slowly, there is enough time variation in our measure of property rights with which we can identify a statistically meaningful relationship with financial development. Of course this association could reflect a direction of causation running from stronger property rights to stronger financial systems. Even though lags of the finance variable are used as instruments in the GMM procedure,[13] shocks to property rights could be serially correlated. In this case financial development may precede amendments to property rights legislation in anticipation of future amendments. Crucially then second-order

[12] When imposing cross-regime constraints on our other model parameters, our threshold estimates exhibited some variability, in the sensitivity section below, we consider the effect on our panel estimates of varying our cut point.

[13] Second (and higher) order lags of the levels of private credit are used as instruments in the first differenced equation, while lags of the first difference of private credit are used as instruments in the levels equation.

serial correlation in the residuals of property rights regression should be absent, and our results suggest that they are (Table 3, column 2).

There is therefore a tentative basis from which we 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, we 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 and the coefficients are statistically insignificant. In our baseline, the coefficient on finance in the high regime is 1.94; the implication is that a ten percent increase in the volume of credit, from 32 to 42 percent, will raise property rights by a 0.5 points. Some of this increase however may have to do with the effect of higher per-capita income on property rights as opposed to finance. Once we control for income, the coefficient on finance falls. Nevertheless the relationship between finance and property rights remains economically and statistically meaningful.

As an illustration of the effect of credit expansion, consider the case of Malaysia, which experienced one of the sharpest expansions in bank credit over the period of investigation. Between 1965 and 1969, the volume of credit allocated to the private sector by Malaysia's banks amounted to a meager 15 percent of GDP, well below the 32 percent threshold separating low and high finance regimes. By 1975 the supply of credit had increased to 24 percent of GDP. During that same period, according to the Fraser Institute, property rights in Malaysia weakened. Thus the expansion in bank credit did not lead to a commensurate increase in property rights, which is what we would expect.

Between 1975 and 1979 the average volume of credit increased to 34 percent, placing Malaysian banks in the high-finance regime. By 2004, the credit to GDP ratios in Malaysia increased by approximately 100 percent of GDP. Based on our estimates this increase should have translated into a 1.1 point increased in property rights in Malaysia. In fact the index of property rights in Malaysia increased by 2.7 points over that period.[14] Thus we can attribute approximately 40 percent of improvement in property rights in Malaysia to a proxy for banking development.

[14] In part this higher increase may reflect a significant increase in per-capita incomes over that same period.

Although identification is a difficult nut to crack, these results are promising. In each of our sub-samples and for every specification that we consider, second order serial correlation is absent and our results pass the Hansen test for over-identifying restrictions. There is then a tentative basis for concluding that improvements in the contracting environment pave the way for stronger property rights. However, this relationship holds only when financial conditions are moderately strong to begin with. In countries where the quality of finance is low, increases in credit supplied by the banking sector has not brought forth stronger property rights in those countries.

Robustness

Although our results are consistent with the theoretical arguments in section two a number of questions related to robustness and interpretation remain. The evidence of thresholds for instance suggests that beyond a point the relationship between finance and property rights changes. However, while the proximate determinant of this nonlinearity might be finance, it may also be any one of a number of correlated alternatives. For instance countries with weaker financial markets are also generally poorer. These countries may be unwilling or incapable of instituting reforms. In this case, what we identify as a low finance regime, where finance is weakly associated with property rights, may actually correspond to a low income regime. Another important criticism of our empirical analysis is that two key variables—the quality of financial intermediation services and the quality of institutions—are measured with error, and our results are therefore limited by the limitations of the data themselves. Below we attempt to address these questions and investigate in general the robustness of our key findings.

We begin by re-examining the evidence on thresholds. Since finance and income are strongly correlated, one interpretation of our findings is that it is income and not finance which separates countries into two regimes. Choosing between these alternatives is difficult. Evidence of linearity is easily rejected in favor of income-based thresholds [Table 4, 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 we 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 2 and Table 4, columns (3a) and (3b) and(4a) and (4b), where we 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 we might jointly test for linearity versus each of these alternatives. Here we consider a two step approach. In the first step, we 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 4. In the second step, we assume these thresholds are *known*, estimate the following regression:

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

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 5A, columns (1) and (2) and Table5B] is suggestive. Thus either income has no effect on the finance-property rights relationship, as our results in column (2) of Table 5A 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 3 to financial development rather than income.

Next we examine the issue of measurement of property rights and finance. Since neither variable is observed directly, there is little scope for addressing this criticism in a completely satisfactory manner however at a minimum we might insist that the results are robust across viable alternatives. Below we report our results from such a robustness exercise in two tables. Table 6 provides additional evidence of nonlinearities in the finance-property rights relationship. The results are arranged in panels. In Panel A, we continue to measure financial development using the logarithm of the volume of credit provided to the private sector, however in addition to our Fraser Institute data, we also consider the index of property rights published by the Heritage Foundation. In Panels B and C we vary the measure of financial development. In particular, we

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 our 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.

Our 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 lower bound on the ratio of commercial to total bank assets is higher than the private credit measure, and as a result splits occur at higher values of our threshold variable[15], 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.

The limited time dimension of the Heritage Foundation's data makes them unsuitable for panel analysis. However in Table 7 we extend our panel analysis using the share of commercial

[15] Interestingly the cut point at which the sample splits varies according to how property rights are measured. Results based on the Fraser institute's data point to similar compositions of countries in low and high finance regimes as those found earlier, i.e. the samples splits at roughly the 60th percentile of banking development, when commercial bank assets account for 85 percent of the total assets of the financial sector. Using the Heritage Foundation data, the split happens much "sooner", when commercial bank assets account for 54 to 58 percent of the total. There is some ambiguity then as to where the relationship between property rights and finance kinks.

bank assets and the liquid liabilities of the financial sector. As before, sample splits into low and high regimes are determined on the basis of earlier threshold regressions (reported in Table 6). The baseline specifications continue to suggest stronger relationships between each finance measure and property rights in countries where financial sectors are more developed. However, this relationship is also statistically significant in the low finance regime, when we proxy for financial development using the share of commercial bank assets. Importantly though this association is significantly stronger in countries where share of commercial assets exceed 85 percent—the cut point between low and high finance regimes.

In more general specifications, where we include controls for income, trade and financial openness, the effect of finance is significantly lower. Once again the key variable here is income, which is highly correlated with measures of financial development; when we control for income the coefficient on finance falls. Nevertheless the relationship between finance and property rights is statistically significant when the ratio of commercial bank assets exceeds the 85 percent cut point, which separates low and high regimes [Table 7, columns 4(a) and (4b)]. When we measure the financial intermediary development using the ratio of liquid liabilities to GDP, the point estimate of the effect of finance is larger in the high finance regime but not statistically significant [Table 7, columns 2(a) and (2b)]. Nevertheless the result is suggestive.

As a further robustness test, in Table 8, we re-estimate the panel regressions using private credit to GDP ratios. However, in this case, we vary the cut points, based on our estimates of the threshold parameter reported in Table 2. In columns (1a and b) to (2a and b), we cut our sample into two when the log of private credit is 3.13. In columns (3a and b) to (4a and b), this threshold is 3.6. As above, we consider two specifications—our baseline and a more general specification that includes income, trade and financial openness as controls. The overall pattern of these results is similar to those reported in Table 3: the effect of finance is always insignificant in the low regimes, but stronger when the ratio of private credit crosses each of the thresholds. Moreover, in all but one case, we find that the relationship between finance and property rights is statistically different from zero. Thus these results are again consistent with the underlying theoretical model.

5. 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 paper we have put forward theory and supporting empirical evidence to suggest that the direction of this relationship could also operate in reverse, i.e. the evolution of property rights can also be influenced by the level of financial development. Our 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, we are 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.

It is not our claim that the role of collateral in financial arrangements is the only way to establish a link from financial development to property rights. However, we believe that it is way that deserves attention since it is based on simple extensions of notions that are already well grounded in the literature.

We provide empirical support for our theory by examining the relationship between property rights and finance in a cross-section of over 100 countries. We find, as predicted that this relationship is nonlinear: finance and property rights are essentially uncorrelated when private credit ratios are below 32 percent, by contrast the relationship between these two variables is positive and significant above this threshold. Further using data on a panel of countries spanning 35 years, we 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 cut point.

The results presented in this paper 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

paper we 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.

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*. Vancouver, BC: 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).

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Table 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. Data on property rights are the Fraser Institute's property rating from 1970 to 2005.

Table 2. 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 we take a log transformation of those data, except for finance where we 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. 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 we take the alternative transformation log(1+finance).

Table 4. 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 5A. 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 5B. 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 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 7. Panel Regressions: Robustness to Alternative Measures of Financial Development

Dependent Variable: property Rights Index, 1970, 1975, 1980, 1985, 1990, 2000, 2005								
	(1a)	(1b)	(2a)	(2b)	(3a)	(3b)	(4a)	(4b)
	Liquid Liabilities				Bank Assets			
	Low	High	Low	High	Low	High	Low	High
Finance	0.006	1.257*	0.316	0.611	2.272***	18.781***	0.033	8.719*
	(0.520)	(0.681)	(0.499)	(0.540)	(0.560)	(6.846)	(0.392)	(4.433)
Income			0.878***	1.847***			1.383***	1.194***
			(0.265)	(0.202)			(0.210)	(0.294)
Trade Openness			-1.648	-0.151			-1.208	-0.467
			(0.904)	(0.467)			(0.598)	(0.433)
Financial Integration			0.357	-0.083			-0.189	0.037
			(0.382)	(0.021)			(0.116)	(0.062)
Number of Countries	83	66	73	62	81	85	72	78
Number of Observations	315	297	269	261	333	341	280	299
First Order Serial Correlation	(0.006)	(0.007)	(0.012)	(0.014)	(0.009)	(0.044)	(0.002)	(0.087)
Second Order Serial Correlation	(0.380)	(0.362)	(0.598)	(0.357)	(0.105)	(0.079)	(0.865)	(0.319)
Sargan Test	(0.300)	(0.134)	(1.000)	(1.000)	0.043	(0.058)	(0.993)	(0.988)

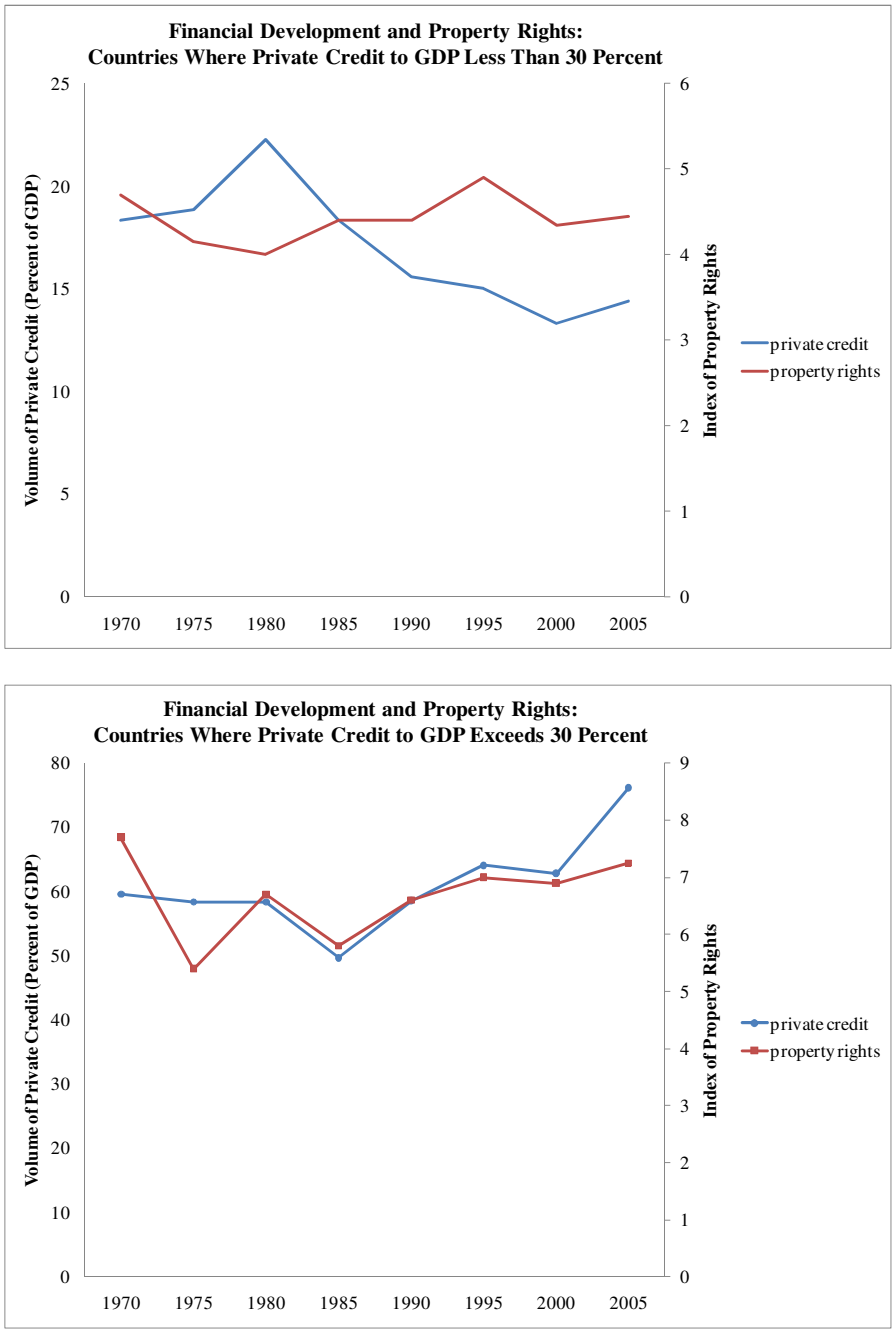
Notes: The dependent variable is Fraser Institute index of property rights in country i in time period j =1970, 1975, 1980, 1985, 1990, 1995, 2000, 2005. For each, j, finance, partisanship, trade openness and financial integration are averages in the five preceding years, while income is measured in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

Table 7. Panel Regressions: Robustness to Alternative Cut Points

Dependent Variable: property Rights Index, 1970, 1975, 1980, 1985, 1990, 2000, 2005								
	(1a)	(1b)	(2a)	(2b)	(3a)	(3b)	(4a)	(4b)
	Low ≤ 3.13	High > 3.13	Low ≤ 3.13	High > 3.13	Low ≤ 3.6	High > 3.6	Low ≤ 3.6	High > 3.6
Finance	-0.121	2.201***	0.215	0.447	0.772*	1.609***	0.222	0.604*
	(0.634)	(0.294)	(0.388)	(0.324)	(0.417)	(0.446)	(0.319)	(0.364)
Income			0.732**	1.804***			1.250***	1.871***
			(0.328)	(0.287)			(0.216)	(0.302)
Trade Openness			0.370	-0.087			-0.169	0.067
			(0.994)	(0.376)			(0.908)	(0.344)
Financial Integration			-0.207	-0.072			0.069	-0.082
			(0.560)	(0.021)			0.334	(0.020)
Number of Countries	69	86	61	80	87	62	78	58
Number of Observations	216	420	179	374	363	273	314	239
First Order Serial Correlation	(0.046)	(0.009)	(0.032)	(0.009)	(0.003)	(0.050)	(0.021)	(0.026)
Second Order Serial Correlation	(0.198)	(0.279)	(0.281)	(0.132)	(0.615)	(0.521)	(0.586)	(0.147)
Sargan Test	(0.629)	(0.420)	(0.995)	(0.954)	(0.053)	(0.174)	(0.970)	(1.000)

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 we take the alternative transformation log(1+finance).

Figure 1. Evolution of Finance and Property Rights Over Time



Notes: Sources: Gwartney and Lawson (2009), Beck et. al. (2000). Starting in 1970, property rights 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 2. Multiple Equilibria

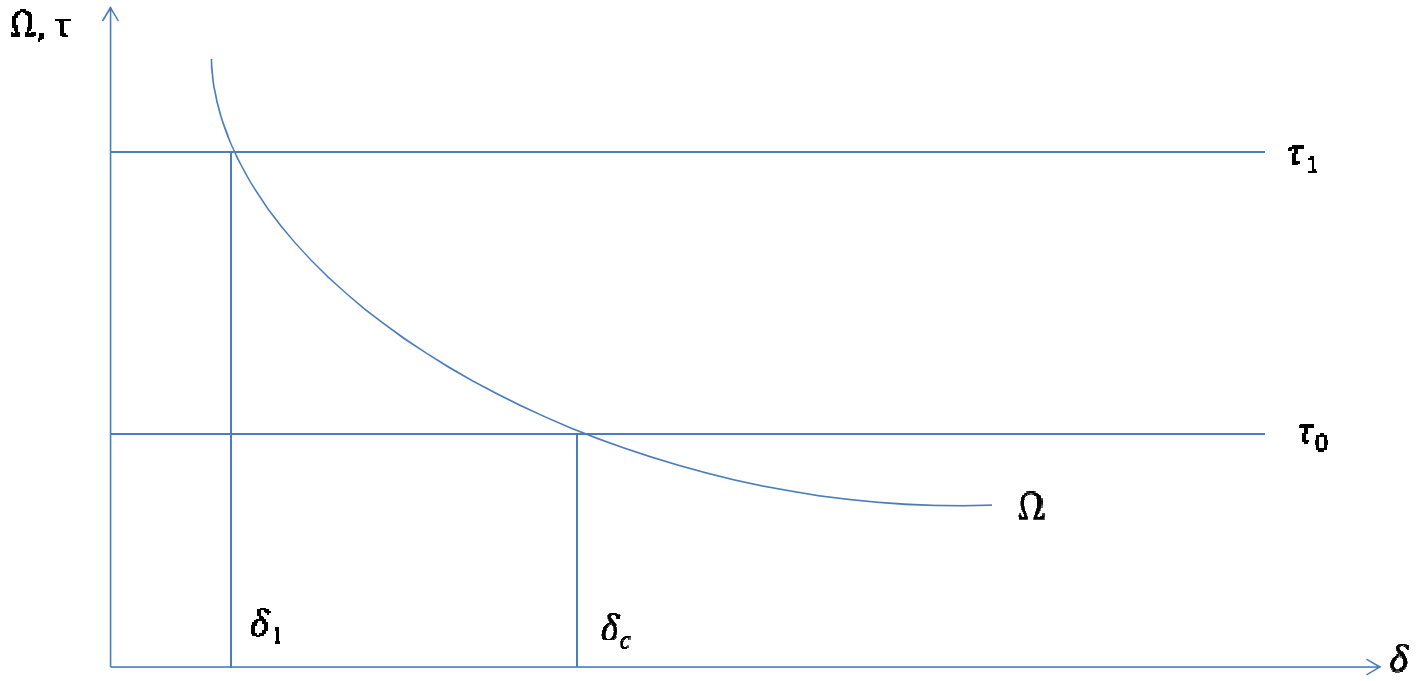
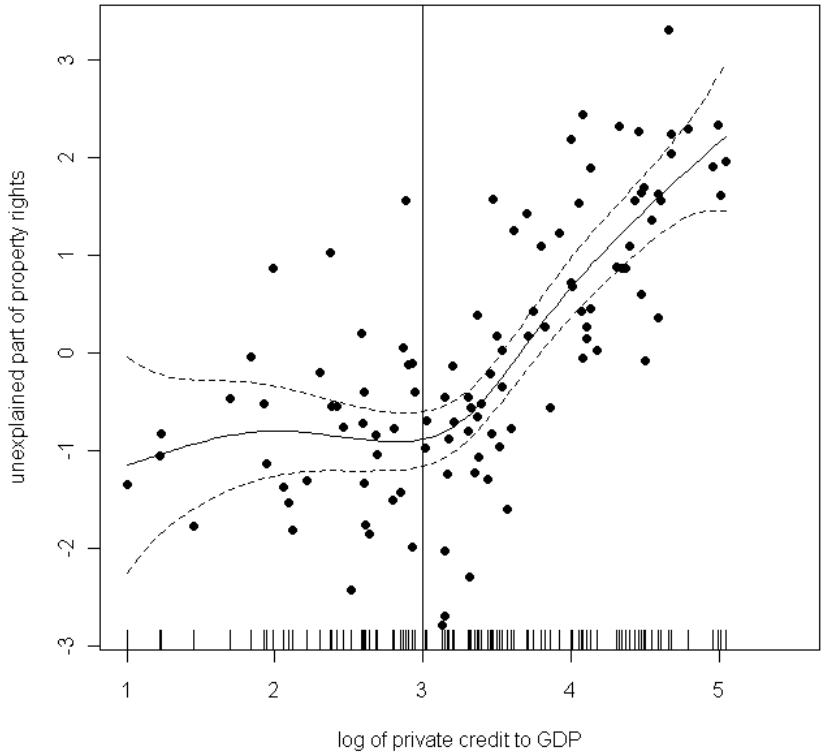


Figure 3. Relationship Between Finance and Property Rights

Property Rights Measured as the Average from 1970 to 2005 of the Gwartney-Lawson Index



Notes: The plot is of the smooth function in (5) along with the 95% confidence bands. The function $s(\varphi)$ was estimated using a penalized linear spline in R using the mgcv package. See Wood (2009) for details.