Explaining the Effect of Financial Development on the Quality of Property Rights

Chandramouli Banerjee, Niloy Bose* and Chitralekha Rath†

July 30, 2015

Abstract

This paper offers an insight into the recent empirical finding which suggest that financial development can catalyze property rights reforms. The explanation is based on a simple trade-off between costs and benefits of securing property. Securing the right to property allows agents to post collateral against loans, bettering their terms. However, securing such rights is costly. We analyze this trade-off along the path of financial development to establish that financial development creates incentives for better property rights institutions. However, for such incentives to materialize, financial development must cross a threshold.

JEL Classification: E02, E44.
Keywords: Financial Development; Property Rights.

*Corresponding Author: nbose@uwm.edu
†Banerjee, Bose and Rath: University of Wisconsin-Milwaukee, Department of Economics, 3210 North Maryland Avenue, Bolton Hall, Milwaukee 53211 USA
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 (Furman et al., 2002). Recently economists have also recognized that a system of strong property rights can enhance efficiency in financial sectors. This is intuitive since legislation protecting property often encompasses financial contracts (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, 2000; 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? There are reasons to believe that this may be the case. For example, certain types of financial reforms, in particular those that relax restrictions on the movement of capital can provide incentives for managers and controlling shareholders to uphold contracts and to better protect minority investors’ rights (Stulz, 2005). Alternatively, since engineering institutions that guard the rights of investors is costly, deep financial markets can be a prerequisite for such institutions to be viable (Miletkov and Wintoki, 2009). Using the Gwartney and Lawson index,1 Bose et al. (2014) offer formal evidence in support of the view that increases in the size of the financial sector catalyze property rights reforms and that such an effect is economically meaningful.2 This paper seeks to explain this empirical regularity. We pivot our explanation on a set activities that form the basis of a financial market and put forward a theoretical argument to suggest that a mature financial system can in fact provide incentives to better codify and protect individuals’ right to ownership.

Our analysis goes a step beyond drawing a line from finance to property rights. While there is empirical evidence to suggest that a mature financial system has influence on the quality of property rights institution, there is no reason to presume that such effect is unconditional. In fact a closer look at the data suggests a non-linear structure which we also capture in our theory. As cursory evidence in support of non-linearity, we present the following patterns present in the data. We divide the time interval 1970-2005 into equal five

1This index published by Fraser Institute rates countries on a scale 0 to 10 - zero representing the lowest quality of property rights institutions. Data is reported in five year intervals. See Gwartney et al. (2009)

2For example, the mean property rights score in 2005 was 5.91 and the standard deviation was 1.85. Depending on the methodology used, a one standard deviation increase in private credit from its average value in 2005 (for a sample of nearly 100 countries) translates into a 0.5 to 1.0 point increase in the property rights index.
year intervals and for each interval we calculate country specific average value of private credit to GDP ratio for a sample of 106 countries. Next, we divide the sample into two-equal sized groups - one containing countries whose (average) private credit-to-GDP ratio never exceeded 30 percent (low finance group) and the other comprising of countries that have this ratio above 30 percent (high finance group). This leaves us with a distribution of private credit-to-GDP ratio corresponding to each time interval for each group of countries. Finally, we calculate the median of this distribution for each time interval. This is the finance variable of our interest. In Figure 1 we plot an index of property rights (Gwartney et al., 2009) over five year intervals from 1970 to 2005 against the constructed finance variable for the preceding five year interval. In the low finance group the private credit-GDP ratio and property rights do not appear to co-move. In the high finance group, however, the changes in property rights closely track changes in the ratio of private credit to GDP. In Figure 2, we offer further cursory evidence. According to the existing literature, institutions are influenced by a cluster of exogenous initial conditions, such as legal origins (La Porta et al., 1999), mortality rates (Acemoglu et al., 2001, 2002), and ethnic compositions (Easterly and Levine, 1997). After controlling for these factors, we plot an estimated relationship between the average of the property rights rating in country \( i \) over the sample period - from 1970 to 2005 - against the average volume of private credit to GDP for the same country. This relationship is estimated using a partially linear additive model (Stone, 1985), where the finance variable enters the equation additively but is estimated using univariate smoother.\(^3\) As before, the plot provides some evidence of nonlinear structure in the relationship between property rights and finance. In particular, the association between private credit to GDP and property rights is essentially zero for 35 percent of countries in our sample for whom the ratio of private credit averaged less than 22 percent of GDP. In the complementary sub-sample, this association is strongly positive. We recognize that Figures 1 and 2 do not provide a formal basis for rejecting linearity.\(^4\) Yet, the results are highly suggestive of two

\(^3\)More specifically we estimate the equation \( \pi_i = s(\phi_i) + x_i^T \beta + u_i \) where \( \pi_i \) represents the average of the Fraser Institute property rights measure in country \( i \) over the sample period, \( \phi_i \) is the average volume of private credit to GDP over the same period, \( x_i \) represents a vector of controls containing the variables discussed above. The smoother \( s(\phi_i) \) is estimated using a penalized spline regression. The plot shows the estimated value \( \hat{s}(\phi_i) \) against \( \phi_i \). In Figure 2, the function \( \hat{s}(\phi_i) \) is referred to as the “unexplained part of property rights”.

\(^4\)To be convinced, we also undertook a more formal test for a threshold in the relationship between property rights and finance in a cross-section of over 100 countries using a procedure suggested by Hansen (1996) and Hansen (2000). The results are qualitatively similar with financial threshold occurring at roughly the median level of private credit ratios - between 31 and 32 percent of GDP. Importantly, the pattern of variation in the effect of finance across regimes is qualitatively similar. To keep our focus on theory, we do
distinct regimes, one in which the quality of financial system 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. With these features in hand, we seek to offer an unified framework that captures the influence of financial development on the quality of property rights institutions and also explains why a certain level of financial maturity is needed before financial development can shape incentives to protect property.

The main argument presented in this paper revolves around a broad notion that the quality of institutions is not impervious to the changes in prevailing economic and social conditions despite being influenced by a cluster of exogenous initial conditions such as legal traditions or natural endowments. In fact, institutions do change. Sometimes the proximate triggers for these reforms have been shifts in ideology - Chile under Augusto Pinochet and China under Deng Xiaoping are good examples. The triggers could also be related to economic conditions. For example, the models of institutional change advocated by Demsetz (1967) and North (1981) suggest that institutions evolve once the economic and/or social gains from institutional change exceed the costs of not doing so. Both argue that technological innovation and the development of new economic markets lead to the introduction of new institutional arrangements or the reform of existing arrangements. Here, we build on these basic ideas and argue that a changing economic environment induced by financial developments can shape the evolution of property rights by altering tradeoffs between the costs and the benefits of protecting property.

We offer a formal theoretical rationale using a simple model of financial intermediation with incomplete information. In our economy individuals must access external funds to operationalize investments. Financial intermediaries ration credit because of the asymmetric nature of information. As a result some borrowers are denied loans. Faced with this possibility, borrowers post assets as collateral to improve the terms and conditions of the loans they receive. However, the gaps in the legislative framework allow for encroachment on these assets. This generates push back from property owners which can take many forms.

---

not report these results which are available upon request.

5 In countries adopting market-oriented reforms, this change has been rapid. Based on an index published by the Cato Institute, which ranks the quality of property rights institutions 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. Based on another indicator of institutional quality - an index assessing constraints on the executive branch of government - Rodrik et al. (2004) report a 40 percent improvement between the 1970s and 1990s in 20 of the 71 countries that composed their sample.
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 that owners wish to safeguard. Protecting property also offers non-trivial benefits via its effects on the contractual arrangements with the lenders. Specifically, the more an individual spends securing property, the more collateral an individual can post to better the terms and conditions of a loan contract. Against this background, we show that the net gain from posting collateral increases with the level of financial development. As a result, mature financial markets generate additional incentives for individuals to secure their right to ownership.

Individual initiative to protect property plays a pivotal role in our analysis. One could however question the relevance of such initiative by pointing out that laws that exist on the book apply equally to all members of the society. Therefore, any private initiative is unlikely to have an effect on the extent to which an individual is able to protect his/her own property. We, however, argue otherwise and view effective property rights as a culmination of the laws that exist on books and the initiatives taken by the members of society at an individual or group level to make these laws work to their benefit. For example, there may exist a law that make encroachment upon privately held land illegal. Yet, an individual must undertake a variety of costly procedures such as surveying the land, drawing up a legal deed, notarizing the deed in court, etc. to uphold such a law. An individual’s effective right to the property also depends on the legal costs which he/she is willing to incur in an event of encroachment. Similarly, putting a fence up around the property or taking measures to prevent trespassing is a private initiative that is a very common practice among land owners. Costly initiatives such as these pre-emptively protect against encroachment and prevent violation of the law that exist on books. Also, it is also often the case that laws that exist on books represent collective interest of a group of individuals and shaping these laws requires members of the group to take costly initiatives (e.g. hiring lobbyists and public relation experts) to rally their cause. Observations such as these let us take the

---

6 We do recognize that costs of enforcing property right could also take a more subtle form such as a misallocation of talent from productive to unproductive sectors (Acemoglu and Verdier, 1996), and an increase in market concentration (Furukawa, 2007). To keep the argument streamlined and tractable, we leave these costs out of our analysis.

7 For example, the Motion Pictures Association of America (MPAA) which represents the interests of six major Hollywood studios has long advocated for the motion picture and television industry through lobbying to protect creative content from piracy and curb copyright infringement. Some of the anti-piracy measures used by them include lobbying for legislature, hosting publicity campaigns against piracy and widespread legal action against entities that engage in such activities.
stand that private initiatives do shape the effectiveness and the quality of property rights institutions and whatever the *de jure* condition of property right protection may be, it is the *de facto* outcome that we are interested in this paper. It is also worth noting that indices that are commonly used to measure the quality of property rights protection (including the Gwartney and Lawson property rights index) reflect our view since these indices are based not just only on the laws that exists on books but also on factors which are by-products of private initiatives taken to uphold such laws.8

In the analysis that follows, we exploit the tradeoff between the costs and benefit of protecting property from the perspective of an individual to draw conclusions at the aggregate level. In doing so, we do not simply aggregate individuals’ behaviors. Instead we recognize that an individual’s cost of protecting property is also affected by the decisions that other individuals make with regard to protecting their own property. This opens the analysis up to a richer set of possibilities and the equilibrium that prevails is uniquely determined by the level of financial development. In particular, beyond a threshold level of financial development, the number of agents initiating safeguards against encroachment increases monotonically with the development of the banking system. Below this threshold, the state of financial development has no effect on the degree to which society secures private property.

The remainder of the paper is organized as follows. Section 2 describes the economic environment. In Section 3, we describe and solve the financial contract between financial intermediaries and borrowers in an imperfect information setting. Section 4 analyzes the effect of financial development on the incentive to protect property at both individual and aggregate levels. Section 5 concludes with some comments.

### 2 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

---

8For example, one of the bases of the Gwartney and Lawson Property Rights Index is the variable *Integrity of the Legal System*, sourced from the International Country Risk Guide’s Political Risk Component I for Law and Order. This variable is constructed to assess the “strength and impartiality of the legal system” (law on the books) as well as “popular observance of the law” which depends on initiatives to uphold such law (law in practice). Both these measures receive equal weight in the construction of the variable.
end of the second period. Each agent is endowed with an unit of an asset.\footnote{For the purpose of exposition, it is beneficial to think of this asset as a plot of uncultivated land.} If rights to property on this asset is fully enforced, then an agent can sell this asset at the end of the second period for a given market value $\upsilon$. An agent also has an opportunity to partake in a business venture (or project) during the first period of her life. A venture undertaken at time $t$ requires a fixed investment\footnote{Again, one can contextualize $x$ as the cost of investment (purchase of machinery, fertilizer etc.) that is necessary for making the land fit for cultivation.} of $x$. The project generates certain amount of output at time $t+1$, each unit of which is sold at a formal market for a price $\rho_{t+1}$. We assume that the demand for the product is given and is downward sloping so that the market price $\rho_{t+1}$ is inversely related to the quantity of product that is available in the market at $t+1$. 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, $r$.

While the cost of operationalizing the asset is same for all individuals, we assume that these project themselves can be of two types - low risk (type-L) or high risk (type-H). A type-L project turns $x$ units of the consumption good into $Qx$ units of output with probability $p_L = 1$, whereas a type-H project converts the same investment $x$ into $Qx$ units of output with a probability $p_H \in (0,1)$, and 0 otherwise. We assume the each agent faces an \textit{ex-ante} probability $\lambda \in (0,1)$ of owning a type-L project, and this realization is private information.\footnote{Alternatively we could assume agents are randomly endowed with different abilities. For example, a fraction $\lambda$ of agents could be endowed with better skills such that the expected returns to their investments are higher. We simplify matters by assuming that projects with different risk characteristics are randomly allocated across individuals.} As it will become apparent, some loan applicants may be adversely selected and denied credit since the project type associated with any given loan applicant is private information. If an applicant doesn’t receive a loan, she scales down the size of her business and produces a \textit{small} amount of output for her own consumption. This outside opportunity generates $\alpha_H$ and $\alpha_L$ units of the consumption to the owners of type-H and type-L projects respectively, and we assume $\alpha_L > \alpha_H$. For notational convenience we normalize $\alpha_H = 0$.\footnote{Strictly, it is only necessary to assume that outside opportunities across the two type of borrowers differs. There are various ways to motivate this. For example, it is possible to interpret this difference as a result of skill heterogeneity: individuals with higher skills can not only generate higher expected project output, but the value of their outside opportunity is also greater.}
In our economy, the arrangements that ensure full rights to property are absent to some degree. However, the quality of property rights institution, whether formal or informal, are not exogenously given. Instead they evolve, driven by the strength of private incentives to invest in property right protection. Though property rights are slack, we assume that an owner of an asset can protect a fraction $\gamma$, of the value of her initial endowment by incurring a monetary and/or time cost in the amount of the $\tau \gamma$. In practice, this cost can take various forms, such as legal costs, the costs of hiring private security, or contribution to lobbying costs incurred when establishing new case law that strengthens property rights (Lanjouw et al., 1998; Lanjouw and Schankerman, 2001) etc.

The timing of events in our economy proceeds as follows. Prior to gaining access to a project, agents choose a value of $\gamma$, 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 $\lambda$ 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. The agents post a fraction of the asset in possession (net of predation) as collateral. Hence, the terms and conditions for loans are influenced an agent’s choice of $\gamma$. 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 $\gamma$. This information is then used in following sections to pin down the optimal value of $\gamma$ for an individual and for the economy as a whole.

3 Financial Contracts

In the first period, borrowers approach banks for loans to finance investments. The idiosyncratic credit risk associated with each borrower is private information. However, the aggregate ex-ante distribution of project types, the project technology, and the outside opportunities faced by type-L versus type-H investors are common knowledge. In addition, loan applicants also reveal the value of their assets (net of predation), $\gamma v$, which is 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 banks’ net interest rate margin. It is well documented that both measures tend to be higher in less developed financial sectors (Demirgüç-Kunt and Huizinga, 2000; Demirguc-Kunt et al., 2003). Accordingly, we interpret lower values of $\delta$ to reflect a more developed financial system and we assume that the value of $\delta$ is 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 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. Thus, in equilibrium, banks earn zero normal profits.

Recall that the project type associated with any given loan application is private information. In response, financial intermediaries exploit known differences between the type-L and type-H project owners when designing a menu of contracts that induces self-selection. In particular a contract offered by the bank is a pair $C_i \equiv \{R_i, \pi_i\}$ for $i \in \{H, L\}$, where $R_i$ is the gross lending rate for a contract of type-$i$ and $\pi_i \in [0, 1]$ is the the probability that a type-$i$ applicant is granted a loan. For a contract that is granted at time $t$, the type-$i$ borrower receives utility $U_i \equiv \pi_i[p_i(Q\rho_{t+1} - R_i)x + \gamma v] + (1 - \pi_i)[\alpha_i + \gamma v]$ where $i \in \{H, L\}$, with $p_H < p_L = 1$ and $\alpha_L > \alpha_H = 0$. The first term in this expression is the net payoff to a borrower from risky project 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. The following proposition fully describes the elements of the contract.

---

13 For similar arguments, see Rothschild and Stiglitz (1976), Bencivenga and Smith (1993), and Bose and Cothren (1996).
Proposition 1 Let \( r \) denote the cost of funds for financial intermediaries. If \((Q_{\rho t+1} - R_L)x > \alpha_L\), then the time \( t \) equilibrium contract given \( \gamma, r, \delta \) is characterized by:

\[
R_L = \frac{xr + \delta}{x}; \quad R_H = \frac{xr + \delta - (1 - p_H)\gamma v}{p_H x} \quad (1)
\]

\[
\pi_L = \frac{p_H Q_{\rho t+1} x - xr - \delta + (1 - p_H)\gamma v}{p_H (Q_{\rho t+1} x - xr - \delta)}, \quad \pi_H = 1 \quad (2)
\]

**Proof** The banks’ zero profit condition on a contract \( \{R_i, \pi_i\} \) is given by:

\[
p_i R_i x + (1 - p_i)\gamma v = rx + \delta \quad (3)
\]

The expression of the left in (3) is the banks’ expected earnings from a loan; it is the sum of the banks’ interest earnings in case of no default (when the project is successful) and the amount that the bank can recover by appropriating the collateral posted in case of a default (when the project is unsuccessful). The expression on the right shows the cost of lending, the sum of the cost of acquiring funds and the cost of intermediation.

The expressions for \( R_i \) for \( i \in \{H, L\} \) follows immediately from the banks’ zero profit condition (3) where we assume \( p_L = 1 \). We also assume \( \gamma v < rx + \delta \), i.e. there is risk associated with lending. This implies, from (1) and (2) that \( R_L < R_H \).

Note that the type-H individuals earn lifetime utility \( U_H = \pi_H [p_H (Q_{\rho t+1} - R_H)x + \gamma v] \) from their contracts \( C_H \) and type-L individuals earn \( U_L = \pi_L [p_L (Q_{\rho t+1} - R_L)x] + (1 - \pi_L)\alpha_L + \gamma v \) from \( C_L \). Now consider the a full information scenario, where banks are able to distinguish between type-L and type-H individuals. In such a scenario, the offered contracts will still earn zero profit for the lenders under competition and banks have no need to deny credit to individuals. Let us define these first best contracts \( C^F_i \equiv \{R_i, \pi_i = 1\} \) for \( i \in \{H, L\} \). Since \( R_L < R_H \), the following inequalities hold: \( U_H(C^F_H) < U_H(C^F_L) \) and \( U_L(C^F_H) < U_L(C^F_L) \). It is clear that if first best contracts are being offered, then a type-H individual has an incentive to misrepresent herself as being type-L (pooling on \( C^F_L \)) but the converse isn’t true. Hence, in order to separate the two types through self-selection, the banks distort the contracts for type-L individuals \( C^F_L \) but have no need to change the contracts for type-H individuals who get their first best contracts \( C^F_H = \{R_H, \pi_H = 1\} \). Given the expressions for \( R_L \) and \( R_H \), the contract for the type-L borrower is then determined by solving the following problem:

\[
\max_{\{\pi_L\}} \quad U_L(C_L) = \pi_L [(Q_{\rho t+1} - R_L)x] + (1 - \pi_L)\alpha_L + \gamma v;
\]

s.t.: \( p_H (Q_{\rho t+1} - R_H)x + (1 - p_H)\alpha_H \geq \pi_L [p_H (Q_{\rho t+1} - R_L)x] + (1 - \pi_L)\alpha_H \quad (4)\)
where equation (4) prevents type-H borrowers from misrepresenting as type-L and \( R_L, R_H \) are given by (1). Given \((Q\rho_{t+1} - R_L)x > \alpha_L\), it is easy to verify that the incentive compatibility constraint (4) must bind in equilibrium. Plugging in values of \( R_L, R_H, \pi_H \) from (1) into the constraint (4) we obtain the expression for \( \pi_L \) as in (2). Further, \( \gamma v < rx + \delta \) ensures that \( \pi_L < 1 \).

According to the proposition above, the separation of borrowers by types is achieved by rationing credit to a fraction of low-risk borrowers - a result that is well-known in ‘adverse selection’ models. Further notice that \( \frac{\partial \pi_L}{\partial \gamma} > 0 \). The intuition is straightforward; higher values of \( \gamma \) (better protection of property) allows borrowers to post more collateral. This reduces lending risk to both type-L and type-H borrowers and banks are able to lower the interest rate they charge to both groups of borrowers. However, note that since \( p_H < p_L = 1 \), \( R_H \) falls leaving the value of \( R_L \) unchanged.\(^ {14} \) Therefore the contract \( C_L \) becomes less attractive to type-H borrowers and banks are able to increase the value of \( \pi_L \) without violating the incentive compatibility constraint in (4). The argument is exactly the same when cost of intermediation, \( \delta \), decreases and we obtain \( \frac{\partial \pi_L}{\partial \delta} < 0 \). Accordingly, the financial sector will supply more credit in more financially mature markets and/or in countries with a strong system of property rights.

4 The Choice of Property Right Protection

The analysis presented in the previous section suggests that stronger property rights (i.e., a higher value of \( \gamma \)) allows individuals to post more collateral when applying for loans, thus improving the terms and conditions of the loan contracts they receive. However, from an individual’s perspective, safeguarding property entails a cost, \( \tau \gamma \), that is proportional to the choice of \( \gamma \). Solving for \( \gamma \) involves optimizing this trade-off. The agent solves this problem with knowledge of the contracts and knowledge of the \textit{ex-ante} probability distribution which determines his chance of being endowed with a project of type-H or type-L, but not knowing what draw she will receive from this distribution \textit{ex-post}. We also assume that an agent takes the value of \( \rho_{t+1} \) as given. The outcome of the optimization is summarized in the following proposition.

\(^ {14} \)A similar effect will transpire if one is to assume that \( p_H < p_L < 1 \). In such case, \( R_H \) will fall more than \( R_L \).
Proposition 2 Assume that $\gamma$ is bounded above and below by $\gamma_{\text{max}}$ and $\gamma_{\text{min}}$ respectively. Further, let $\Omega(\delta, \rho_{t+1}) \equiv \nu \left[ 1 + \lambda \left( \frac{1-p_H}{p_H} \right) \frac{Q\rho_{t+1}^\delta_{\delta-xt-\delta} - \alpha_L}{Q\rho_{t+1}^{\delta-xt-\delta}} \right]$. Then an individual optimally chooses $\gamma = \gamma_{\text{max}}$ if $\Omega(\delta, \rho_{t+1}) > \tau$ and $\gamma = \gamma_{\text{min}}$ if $\Omega(\delta, \rho_{t+1}) < \tau$.

Proof Please recall that for a contract that is granted at time $t$, type-L borrower will receive utility $U_L = \pi_L[p_L(Q\rho_{t+1} - R_L)x + \gamma v] + (1 - \pi_L)[\alpha_L + \gamma v]$, with $\alpha_H = 0$. The first term in this expression is the net pay-off to a type-L borrower from the project in the event that loan is granted and the project is successful. The second term represents the pay-off in the event when the project is not funded. An equivalent expression for a type-H borrower is given by $U_H = \pi_H[p_H(Q\rho_{t+1} - R_H)x + \gamma v] + (1 - \pi_H)[\alpha_H + \gamma v]$ with $\alpha_H = 0$. Given the ex-ante probability of being assigned a type-L project $\lambda$, the individual solves the following optimization problem.

$$\max_{\gamma} U \equiv \lambda U_L + (1 - \lambda) U_H - \tau \gamma$$

(5)

On substituting the expressions for $U_H, U_L$ from above and for $R_L, R_H$ and $\pi_L, \pi_H$ from (1) and (2), it follows that (5) implies $\frac{\partial U}{\partial \gamma} = \Omega(\delta, \rho) - \tau$. Accordingly, an individual sets $\gamma = \gamma_{\text{max}}$ if $\Omega(\delta, \rho_{t+1}) \geq \tau$ and $\gamma = \gamma_{\text{min}}$ if $\Omega(\delta, \rho_{t+1}) < \tau$.

The above result is easy to interpret. A higher $\gamma$ implies both a welfare gain and a welfare loss. The objective function in (5) is linear in $\gamma$ and the term $\Omega(\delta, \rho_{t+1})$ represents the marginal benefit of improving property rights. This includes the welfare gain which follows from an improvement in the terminal value of the land, $\gamma v$, and the consequent improvement in the terms and conditions of loan contracts. Whereas, $\tau$ represents the marginal costs associated with property rights improvement. Depending on which is greater, the agent sets $\gamma$ either at its maximum or at its minimum value.

The results obtained above characterize the precise conditions under which an individual will seek to protect her property. These conditions depend on two economy wide variables $\delta$ and $\rho_{t+1}$. For the purposes of this paper, we treat $\delta$ as exogenous since our principal focus is on the causality running from financial development to the quality of property rights. However, we allow $\rho_{t+1}$ to vary with market conditions by appealing to two simple notions. First, the total production and consequently the market supply of output depend on the extent to which property rights is enforced in the economy. This is true because as more individuals choose to enforce property rights, banks are able to make more loans and borrowers’ access to credit improves on the average. As a result the economy becomes more productive. Second, the market demand for output is given and is downward sloping.
so that the market price for output, $\rho_{t+1}$, is inversely related to the market supply that is available at $t + 1$. Together they imply that individuals’ collective choice of property rights matters for pricing of output. We formalize this by postulating that $\rho_{t+1} \equiv \rho_{t+1}(\mu_t)$ such that $\rho'_{t+1}(\mu_t) < 0$, where we define $\mu_t \in [0, 1]$ to be the fraction of individuals choosing $\gamma = \gamma_{\text{max}}$ during time $t$. It is worth noting that while collective choice of the individuals regarding property rights matters for the value of $\rho_{t+1}$, an individual’s time $t$ choice of property rights is influenced by the value of $\rho_{t+1}$ (through Proposition 2). We exploit this feedback loop in the next proposition to demonstrate how economy-wide choice of property rights varies when $\delta$ takes a value from high to low representing a transition from low to high levels of financial development.

**Proposition 3** Given $\mu_t$ is the fraction of individuals choosing $\gamma = \gamma_{\text{max}}$ during time $t$;

(i) There exists a critical level of financial development $\delta_c$ such that when $\delta > \delta_c$ the equilibrium in this economy at time $t$ is characterized by the unique behavior profile where all agents set $\gamma = \gamma_{\text{min}}$, i.e., $\mu_t = 0$. 

(ii) There exists a level of financial development $\delta_f < \delta_c$, such that when $\delta$ decreases in the interval $(\delta_f, \delta_c)$ $\mu_t$ increases monotonically to attain the value of 1 at $\delta_f$.

**Proof** Define $\Omega_1(\delta) \equiv \Omega(\delta, \rho_{t+1}(\mu_t = 1))$ and $\Omega_0(\delta) \equiv \Omega(\delta, \rho_{t+1}(\mu_t = 0))$. Since, $\rho'_{t+1}(\mu_t) < 0$ and since $\frac{\partial \Omega}{\partial \rho_{t+1}} > 0$, we have $\Omega_1(\delta) < \Omega_0(\delta)$. Let $\delta_f$ and $\delta_c$ solve $\Omega_1(\delta_f) = \tau$ and $\Omega_0(\delta_c) = \tau$, respectively. Since $\Omega_1(\delta) < \Omega_0(\delta)$ and since $\frac{\partial \Omega}{\partial \delta} < 0$, we have $\delta_f < \delta_c$.

Suppose $\delta > \delta_c$ and consider a behavior profile where all individuals choose $\gamma = \gamma_{\text{min}}$, i.e., $\mu_t = 0$. Since by definition $\Omega_0(\delta_c) = \tau$ and $\frac{\partial \Omega}{\partial \delta} < 0$, we must have $\Omega_0(\delta) < \tau$, and (according to Proposition 2) no agent has an incentive to deviate from this behavior profile. Further, to see that this behavior profile represents an unique equilibrium, consider the behavior at the other extreme, where all agents set $\gamma = \gamma_{\text{max}}$, i.e., $\mu_t = 1$. Accordingly, $\Omega = \Omega_1(\delta)$. Since, $\Omega_1(\delta) < \Omega_0(\delta)$ and since $\Omega_0(\delta) < \tau$, we have $\Omega_1(\delta) < \tau$. Thus, it is optimal for an individual to deviate from this behavior profile and set $\gamma = \gamma_{\text{min}}$. Accordingly, the aggregate outcome is not supported by a behavior profile where $\mu_t = 1$.

Suppose that $\delta \in (\delta_f, \delta_c)$ for which $\Omega_0(\delta) > \Omega_0(\delta_c) = \tau$. Consider a pure behavior profile where $\mu_t = 0$. Since the marginal benefit from protecting property is greater than the marginal cost, it is optimal for an agent to deviate from this profile and set $\gamma = \gamma_{\text{max}}$.

---

15 Refer to Figure 3 for a diagrammatic representation.
It is easy to see that since $\Omega_1(\delta) < \Omega_1(\delta_f) = \tau$ will hold for any $\delta \in (\delta_f, \delta_c)$, an aggregate behavior profile with $\mu_t = 1$ also cannot support an equilibrium. Thus, neither $\mu_t = 0$ nor $\mu_t = 1$ support an equilibrium when $\delta \in (\delta_f, \delta_c)$. There exists, however, an equilibrium which is supported by a mixed behavior profile with $\mu_t \in (0, 1)$. To see this, consider $\delta = \delta_m \in (\delta_f, \delta_c)$ and a mixed behavior profile where $\mu_m$ fraction of agents set $\gamma = \gamma_{\text{max}}$ and the rest set $\gamma = \gamma_{\text{min}}$. Since, $\rho_{t+1}^\prime(\mu) < 0$ and $\frac{\partial \Omega}{\partial \rho_{t+1}} > 0$, we have $\Omega(\delta_m, \rho_{t+1}(\mu_t = 0)) > \Omega(\delta_m, \rho_{t+1}(\mu_t = \mu_m)) > \Omega_1(\delta_m, \rho_{t+1}(\mu_t = 1)) \equiv \Omega_1(\delta_m)$. In this circumstance, any value of $\mu_m$ for which the relation $\Omega(\delta_m, \rho_{t+1}(\mu_t = \mu_m))) = \tau$ holds then supports an equilibrium outcome where only $\mu_m$ fraction of agents choose $\gamma = \gamma_{\text{max}}$ and the remaining choose $\gamma = \gamma_{\text{min}}$. Further, given that $\rho_{t+1}^\prime(\mu) < 0$, $\frac{\partial \Omega}{\partial \rho_{t+1}} > 0$, and $\frac{\partial \Omega}{\partial \delta} < 0$, the above equilibrium condition implies $\frac{d \mu}{d \delta} = -\frac{\partial \Omega/\partial \rho_{t+1}^\prime(\mu)}{\partial \Omega/\partial \delta} < 0$. Accordingly, as $\delta \to \delta_f$, more and more individuals will choose $\gamma = \gamma_{\text{max}}$ and $\mu_m \to 1$.

The intuition behind the above results is easy to obtain. Note that the benefit of protecting property depends on the level of financial development, $\delta$, as well as on the market price for output, $\rho_{t+1}$. The benefit increases with the value of $\rho_{t+1}$, whereas it is inversely related to the value of $\delta$. When $\delta > \delta_c$, the benefit from protecting property is so low that it is optimal for an agent not to deviate from a strategy profile where $\gamma = \gamma_{\text{min}}$ even when an agent faces the prospect of fetching a high market price for output. Now, consider when $\delta$ falls below $\delta_c$ resulting in an increase in the benefit. In this case, if all agents choose to protect their properties, then the benefit from the fall in $\delta$ may not be sufficiently large to offset potential negative price effects arising from an increase in the market supply. Accordingly, in the range, $\delta \in (\delta_f, \delta_c)$, the equilibrium is supported only by a fraction of agents choosing $\gamma = \gamma_{\text{max}}$. A further fall in $\delta \in (\delta_f, \delta_c)$ offers more room to offset the negative price effect and therefore creates a condition for more agents to enforce property rights. Together, these results offer an explanation as to why financial development matters for the quality of property rights institutions and why it is the case that economies must cross a threshold level of financial development before further developments in the financial sector can create incentives to strengthen property rights.

The analysis that we present here is simple, yet flexible enough to include other features that one may view as relevant for the present context. For example, throughout the analysis we have taken the view that the cost of enforcing property, $\tau$, is unaffected by individuals’ choice. This, however, need not be the case. For example, one could argue that due to high demand, the prices of services that are essential to protect property should rise with more individuals attempting to protect their property, and therefore $\tau$ should increase.
with $\mu$. It is also reasonable to argue that a higher demand for property rights may enable an economy to offer the necessary services in a more cost effective manner. As a result, $\tau$ should in fact decrease with $\mu$. It is easy to include both possibilities into the analysis while preserving the underlying mechanism and the main results.\footnote{In the case where $\tau'(\mu) < 0$, the analysis requires a few restrictions on the parameters to ensure a smooth transition from low to high property rights along the path of financial development. No such restrictions are necessary when $\tau'(\mu) > 0$. Both analyses are available upon request.} To keep our exposition simple, streamlined and short, we have chosen not to include these features explicitly in the main presentation.

5 Conclusion

In this paper we have put forward an explanation in support of the empirical evidence that the cross-country variation in the development of financial markets can account for international variation in property rights. Our basic argument is simple: stronger property rights enable borrowers to post collateral leading to an improvement of the terms of their financial contracts. This marginal benefit to securing property increases as financial markets mature and the costs of intermediation decline. This, in turn, creates incentives for individuals and society to incur costs that is necessary for the improvement of property rights institution.

In spite of its simplicity, the model produces a rich variety of outcomes. 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 leading to more secure property rights.

Finally, 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.
Figures

Figure 1: Evolution of Property Rights and Finance Over Time
Figure 2: Relationship between Finance and Property Rights

Figure 3: Multiple Equilibria and Threshold Effects in Proposition 3
References


