Creating Collateral: The de Soto Effect and the Political Economy of Legal Reform*

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Abstract

In advanced economies, collateralization of fixed assets plays a key role in supporting arms-length trade. But effective collateral requires secure property rights so that assets can be pledged against default. Otherwise, trade is restricted to relational contracting within networks which use social collateral. This paper develops a model of contracts and matching of producers and suppliers where collateral matters and property rights are imperfect. In this setting, we study the partial and general equilibrium effects of legal reforms which enhance the use of formal collateral. We lay bare the mechanism by which these reforms expand the scope of arms-length trade and market development. The model is used to gain some insights into the political economy of legal reform and, in particular, the frictions that can inhibit reform in this context.

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1 Introduction

Collateral is the bedrock on which much of the financial system operates.[1] However, effective collateral to support trade requires secure property rights so that assets can be pledged against the possibility of contractual default. An important aspect of economic development is the creation of such rights through legal reforms such as increasing the effectiveness of courts in enforcing contracts and creation of property registries to establish ownership and facilitate asset transfers. Where property rights are poorly developed, as is the case in many parts of the developing world, the use of formal collateral is difficult.

To gauge the importance of collateral, consider the example of the United States. The Securities Industry and Financial Markets Association estimates that there were nearly \$7 trillion dollars worth of outstanding mortgage backed securities in 2007, equal to 50% of U.S. annual nominal GDP. These contracts are based on housing which serves as collateral in the event of default. While in the US, the ratio of mortgage debt to GDP was 58% in 2002, it was no more than 14% in any Latin American country, no more than 11% in any Middle Eastern country (except Israel) and no more than 22% in any South or East Asian economy (except Japan, Taiwan, Singapore and Hong Kong).[2] Cross country evidence suggests that the ratio of private credit to GDP is positively correlated with legal rights of lenders (e.g., ability to force repayment, seize collateral), and that changes in this measure are associated with an increase in the ratio of private credit to GDP (Djankov, McLiesh, and Shleifer, 2007). Evidence from India suggests that legal reforms that facilitated recovery of secured non-performing loans reduced delinquency and interest rates (Visaria, 2007).

Policy commentators, such as Hernando de Soto (2000, 2001), have championed the role of property rights to improve the availability of collateral in the developing world. He states:

> "What the poor lack is easy access to the property mechanisms that could legally fix the economic potential of their assets so that they could be used to produce, secure, or guarantee greater value in the expanded market...Just as a lake needs hydroelectric plant to produce usable energy, assets need a formal

[1] See Geanakoplos (2003) for an overview.

[2] See Green and Wachter (2005).

> property system to produce significant surplus value." (de Soto, 2001).

This sentiment was echoed in an earlier era by Peter Bauer who observes in his perceptive study of West African trade that

> "Both in Nigeria and in the Gold Coast family and tribal rights in rural land is unsatisfactory for loans. This obstructs the flow and application of capital to certain uses of high return, which retards the growth of income and hence accumulation." (Bauer, 1954 p. 9).

What are the channels, both partial and general equilibrium, through which improving collateral affects resource allocation? What are the welfare effects on borrowers and lenders which affect the political economy of reforms aimed at improving the availability of collateral?

To answer these questions - which have not received much analytical treatment - we develop a model of contracting between a producer (or borrower) and a supplier (or lender).[3] Suppliers face a moral hazard problem and imperfect property rights over fixed assets inhibit the use of wealth as collateral. The model gives a precise account of how imperfect property rights affect economic efficiency and output. We also show how improving the ability to use wealth as collateral increases the surplus created in a producer-supplier relationship.

To give a flavor of the model, imagine that there is a variety of producers and suppliers. The latter vary in their efficiency to produce inputs which they supply. Some producer-supplier pairs may have access to privileged enforcement technologies which we refer to as networks. Others use the common enforcement technology available through the formal legal system. To fully appreciate how attenuated property rights impact on the economy in this setting, it will be key to understand the matching process which determines who trades with whom.

When formal property rights are weak, producers frequently choose relationship based trade (e.g., rural moneylenders) since informal property rights established within networks may be better enforced than those under the formal legal system. Indeed, this phenomenon is often referred to as *social*

[3] See Besley (1995) for a partial equilibrium account.

collateral.[4] Weak legal systems imply that networks may survive due to their advantage in contract enforcement even if they are less efficient in other ways. Also, relationship based trade creates natural entry barriers as access to the enforcement technology is limited.[5]

Collateral backed by a formal legal system therefore creates a basis for competition between suppliers as they all have access to the same enforcement technology. Producers can then engage in arms-length trade with a wider set of suppliers. Whether a particular producer chooses to use a network (relationship-based trade) or the market (arms-length trade) now depends on the trade off between better enforcement and the benefits of competition.

Our model characterizes the set of stable matches between producers and suppliers for a given set of enforcement possibilities and supplier efficiency. Having studied this "general equilibrium" of the economy with networks and markets, we then look at what happens when the formal legal system improves. An important implication of our analysis is that improved property rights create more competition in the market. This allows us to understand how supplier rents are created in a supplier-producer relationship given the producers option to switch to another supplier. These rents turn out to be important as they are affected by improvements in the formal legal system. Rents are of two forms. Network suppliers earn rents by virtue of having a superior legal enforcement capacity which is not accessible by outsiders. Market suppliers earn rents by being more efficient even though they use the formal legal system which everyone has access to.

Finally, we use this analysis to consider the political economy of legal reform. The main lesson is a precise theoretical understanding of the interplay between economic and political institutions. Improvements in formal legal systems to expand the use of collateral in market arrangements affect rents by increasing competition for the traditional elite (network suppliers) and the new elite (market suppliers). The relative power of each elite determines what will happen. We also consider what happens in a democratic setting where the power of elites is less important than that of producers. In general, strong market competition and democracy create the most favorable environment for legal reforms to be adopted. However, even with democracy, we find that if there is insufficient market competition among suppliers, there

[4] See Besley and Coate (1995), and Mobius and Szeidl (2007).

[5] See Rajan and Zingales (1998) for a discussion.

can be grass-roots resistance to the creation of formal property rights that allow assets to be collateralized.

The remainder of the paper is organized as follows. In the next section, we discuss how this paper relates to previous contributions. In section three, we lay out the basic model and in section four we study the first-best benchmark. Section five looks at second-best contracts, i.e. those constrained by agency and transactions costs. Section six looks at matching between producers and suppliers introducing conditions for stable matching. In section seven, we study the interplay between markets (arms-length trade) and networks (relationship-based trade). Section eight studies the political economy of legal reform and section nine concludes.

2 Related Literature

The functioning of capital markets is now appreciated to be a key determinant of the development process (see Banerjee, 2004 for a review). Within this, how contracts are formed to support trade in credit and land markets in the presence of transactions costs, and how these are affected by the legal system is a major topic. There is also a growing empirical literature that has focused to a significant degree on the consequences of titling programs for farm productivity and other household allocation decisions (see Pande and Udry, 2005 for a review). The empirical literature offers some support to the idea that strengthening land titles improves productivity by reducing insecurity, and (to a more limited extent) by improving credit market access.

This micro-economic literature is complemented by a macro-economic literature which studies how aspects of legal systems affect the development of financial markets. One distinctive view is the legal origins approach associated with La Porta et al (1998). They argue that whether a country has a civil or common law tradition is strongly correlated with the form and extent of subsequent financial development with common law countries having more developed financial systems. In similar vein, Djankov et al. (2007) find that improvements in rights which affect the ability of borrowers to use collateral are strongly positively correlated with credit market development in a cross-section of countries. This is part of a wider literature which considers institutional determinants of economic development (for example, Acemoglu, Johnson and Robinson (2001) and Engerman and Sokoloff (2002)).

The extent of informality in economic transactions is a well-understood feature of development. This phenomenon is particularly true in the context of credit markets where much credit comes through informal sources – friends, families, money lenders etc. The historical experience of financial development is a greater reliance on arms-length transactions with a concomitant reduction in the importance of relationship-based trade as development proceeds. There is some debate about the costs and benefits of these two different systems. As Rajan and Zingales (1998) point out, a financial system has two main roles: (i) to channel resources to the most productive use (ii) to make sure that an adequate portion of the returns accrue to the financier. In an arm's length system the financier is protected by an explicit contract enforceable in a court of law. Relationship based systems tend to work when legal transactions are poorly enforced. They argue that relationship based systems will tend to misallocate capital. This is consistent with a growing body of evidence. For example, Banerjee, Duflo and Munshi (2003) review studies from India which confirm this.

There is growing interest in how social networks function in the economy. Much of the existing literature, as reviewed in Fafchamps (1992, 2005), focuses on how long-term interactions can be a device for supporting relationship-based trade. These issues are also studied at length in Dixit (2004) which recognizes the importance of networks in governance. This line of work relates to a broader emerging literature on network formation and dissolution which is reviewed in Jackson (2005). One theme in the literature on networks is the importance of externalities across networks and whether or not network formation is efficient. As Jackson (2005) shows, this depends on the specification of the model and how the network formation game is specified.

The paper is closely related to the literature on the interaction between markets based on arms-length exchange and the informal (network-based) sector built on the informational advantages of more relationship-based exchange (Banerjee and Newman, 1998 and Kranton, 1996). They study the implications of pecuniary or search externalities between markets and networks, highlighting the ambiguous welfare effects that social networks can have. Our paper focuses instead on the effect of *changes* in formal institutions, and how this affects resource allocation.

The paper is also related to an emerging literature on the political economy of institutional reform. For example, Caselli and Gennaioli (2006) and Perotti and Volpin (2007) study the political economy of improvements in investor protection. Both emphasize the possibility that weak legal systems can limit competition and hence may lead those who earn rents to block reforms.[6] The focus on rent protection as a source of underdevelopment supports the general thrust of arguments in Rajan (2007). Related also is the study of debt bondage by von-Lilienfeld-Toal and Mookherjee (2007) who argue that the elimination of debt bondage (something which can improve the enforcement of contracts) can be explained by the general equilibrium effects on the allocation of rents.

3 The Model

The model studies contracting between a producer and a supplier. The producer's effort is subject to moral hazard and in addition, the producer has limited pledgeable wealth creating a limited liability problem. It is a variant of a standard agency model (see Innes, 1990) that is often used to analyze contractual issues in development.[7] The only modification is that contract enforcement is limited due to imperfections in the court system which reduces the collateralizability of wealth.

Economic Actors There are M suppliers labelled $j = 1, ..., M$ and N producers labelled $i = 1, ..., N$ with $N > M$. Each producer owns a unit of land and uses effort $e \in E \equiv [0, \overline{e}]$ and an input $x \in X \equiv [0, \overline{x}]$ (e.g., capital) to produce output. Each producer i is assumed to be endowed with the same level of illiquid wealth w. The input x can be supplied by supplier j at unit cost $\gamma_j \in [\underline{\gamma}, \overline{\gamma}]$. The lenders are ordered in terms of their unit costs: $\gamma_1 \leq \gamma_2 \leq ... \leq \gamma_M$.We assume that each supplier has unlimited capacity to supply the market.

One interpretation of our model is as a credit market where x is a loan made to the producer and suppliers are financial intermediaries which borrow money from risk neutral depositors whose discount factor is β. Financial intermediary j repays depositors with probability μ_j. This could reflect intrinsic trustworthiness or the state of the intermediary's balance sheet, e.g. its wealth. In this case $\gamma_j = 1/\beta\mu_j$ is intermediary j's cost of funds which is lower for more trustworthy intermediaries. Naturally, $\underline{\gamma} \equiv 1/\beta$ sets a natural lower bound for the marginal cost of capital.

[6] See also Acemoglu (2004) and Sonin (2003).

[7] See, for example, Mookherjee and Ray (2002), and Banerjee, Gertler and Ghatak (2002).

Production Technology Output is stochastic and takes the value $q(x)$ with probability $p(e)$ and 0 with probability $1 - p(e)$. The marginal cost of effort is one and the marginal cost of x is γ. Expected "surplus" is

$$p(e)q(x) - e - \gamma x.$$

The assumed production technology allows for the producer output to have observable and unobservable components. For e we have in mind inputs that are typically not observed in production data, i.e. beyond raw inputs. For x we have in mind traded inputs. A core example in what follows is credit supply where x is some kind of capital that needs to be acquired through securing credit. However, another relevant example would be the acquisition of a new technology.

Throughout the analysis we make the following regularity assumption which ensures a well-behaved maximization problem with interior solutions.

Assumption 1 *The following conditions hold for the functions $p(e)$ and $q(x)$:*

(i) Both $p(e)$ and $q(x)$ are twice continuously differentiable, strictly increasing and strictly concave for all $e \in E, x \in X$.

(ii) $p(0) > 0$, $p(\overline{e}) < 1$, $q(0) = 0$, and $q(\overline{x}) \leq \overline{q}$ where $\overline{q}$ is a finite positive real number.

(iii) The Inada endpoint condition holds for both $p(e)$ and $q(x)$ as $e \to 0$ and $x \to 0$.

(iv) $p(e)q(x)$ is strictly concave for all $e \in E, x \in X$.

These assumptions are all fairly standard.[8]

Information and Contracting We assume e is subject to moral hazard. In principle, this can be solved if producers have sufficient wealth. However, liability for losses is limited. The most that can be taken away from a producer in any state of the world is his wealth and any output that he produces. The input x is fully contractible. Producers and suppliers are assumed to be

[8] These hold, for example, if $p(e) = a + e^{\alpha}$ and $q(x) = x^{\beta}$ where $\overline{e} < 1$, $\overline{x} < 1, a \in (0, 1 - \overline{e}^{\alpha}), \alpha \in (0,1)$, $\beta \in (0,1)$, and $\alpha + \beta < 1$.

risk neutral. Without loss of generality an input supply contract is a triple (r, c, x) where r is the payment that he has to make when the project is successful and c is the payment to be made when the project is unsuccessful.[9] It will be useful to think of r as repayment and c as collateral.

The payoff of a typical producer is:

$$p(e)\{q(x) - r\} - (1 - p(e))\, c - e.$$

and of supplier j is:

$$p(e)r + (1 - p(e))\, c - \gamma_j x.$$

We assume that producer i has an outside option of $u_i \geq 0$. This will be determined endogenously when we permit suppliers to compete to serve producers.[10] Since we assume $q(0) = 0$, the autarky payoff is 0.

Property Rights and Contract Enforcement We assume that contracts are imperfectly enforced and/or property rights are poorly defined. This affects the producers' ability to pledge his wealth as collateral. Let $k \in \{0, 1\}$ denote the state of the world in terms of project outcome with $k = 0$ corresponding to project failure (zero output) and project success (non-zero output) respectively.

After the state of the world k is revealed, the producer can refuse to honor the contract. In that event, the supplier can appeal to a third party. In the context of formal contracting, this can be thought of as going to court. In the case of informal contracting, this can be thought of as approaching an influential person within the network (e.g., the village headman, or the mafia). With probability σ_{ij} the court can observe the true state of the world *and* successfully enforce a contract (measure of court effectiveness) and can award a fine F_k in state k to the producer in addition to contractual obligations. With probability $(1 - \sigma_{ij})$ the arbiter receives an uninformative ("null") signal and/or he receives an informative signal but cannot successfully enforce the contract. In this case with probability ϕ_{ij} the producer gets his preferred outcome and with probability $\left(1 - \phi_{ij}\right)$ the supplier gets his preferred outcome where ϕ_{ij} captures the relative influence of the producer

[9] As Innes (1990) shows, even if output took multiple values or was continuous, the optimal contract has a two part debt-like structure as here.

[10] Observe that we are defining producer payoffs net of any consumption value that he gets from his wealth which may, for example, be held in the form of housing.

(or, equivalently, the bias of the arbiter). With secure property rights and efficient courts σ_{ij} will be high. For example, creating formal titles is one way of reducing ϕ_{ij} as it may allow independent recourse to suppliers to claim the assets of the producer after a contractual dispute.

It is useful to define

$$\tau_{ij} \equiv \frac{(1-\sigma_{ij})\,\phi_{ij}}{(1-\sigma_{ij})\,\phi_{ij}+\sigma_{ij}} \in [0,1] \tag{1}$$

as a "transactions cost" associated with trade between producer i and supplier j. If courts are frictionless ($\sigma_{ij}=1$) or suppliers are influential ($\phi_{ij}=0$) then the transactions cost τ_{ij} is zero. The more imperfect courts are (low σ_{ij}), and the more powerful producers are (high ϕ_{ij}), the higher will be transactions costs.

4 The First Best

As a benchmark, we work out first the allocation that will emerge in the absence of any informational or contractual frictions. In particular, suppose that effort is contractible and there are no problems of contract enforceability (e.g., $\sigma_{ij}=1$). In that case the level of effort and the input will be chosen to maximize joint surplus. The first-best $(e^*(\gamma), x^*(\gamma))$ is characterized by the following first-order conditions:

$$p'(e^*(\gamma))q(x^*(\gamma)) = 1 \tag{2}$$

$$p(e^*(\gamma))q'(x^*(\gamma)) = \gamma. \tag{3}$$

Assumption 1 implies that these are interior solutions. Effort and credit are complementary inputs in expected output. Therefore, a fall in γ or any parametric shift that raises the marginal product of effort or capital will raise both inputs.

Let the first-best surplus be denoted by

$$S^*(\gamma) = p(e^*(\gamma))q(x^*(\gamma)) - e^*(\gamma) - \gamma x^*(\gamma).$$

This surplus can be shared arbitrarily between the producer and supplier depending on the outside options. In the spirit of what comes next, assume that the producer has an outside option $u \geq 0$ (which is taken as exogenous for now). The supplier earns $\pi = \max\{S^*(\gamma) - u, 0\}$ where this respects his outside option of zero. Since property rights are irrelevant in the first best, matching of producers and suppliers is trivial. Each producer will look for a supplier who can supply the input at least cost. So long as there are at least two suppliers with cost $\underline{\gamma}$, then with unlimited capacity, the logic of Bertrand competition implies that the market will be served entirely by low cost suppliers who will earn no rents. Hence, the expressions above will all hold with $\gamma_j = \underline{\gamma}$ and zero profits for the supplier. This represents the perfect market outcome for this model with neither information nor enforcement problems.

5 Second Best Contracts

The main case of interest is the second best where contracts are constrained by information and enforcement.

5.1 The Optimal Contracting Problem

If effort is not contractible, there is an agency problem in effort supply. Efficient contracts between supplier j and producer i will solve:

$$Max_{\{e,x,c,r\}}\ p(e)\,r + (1 - p(e))\,c - \gamma_j x. \tag{4}$$

subject to:
(i) the **participation constraint (PC)** of the producer

$$p(e)\{q(x) - r\} - (1 - p(e))\,c - e \geq u_i. \tag{5}$$

(ii) an **incentive compatibility constraint (ICC)** on effort by the producer.

$$p'(e)\{q(x) - (r - c)\} = 1. \tag{6}$$

(iii) **enforceability constraints:** these are, in the state 0 and in state 1 :

$$-c \geq -\sigma_{ij}(c + F_0) + (1 - \sigma_{ij})(p_{ij}(0) - (1 - p_{ij})\,c) \tag{7}$$

$$(q(x) - r) \geq \sigma_{ij}(q(x) - r - F_1) + (1 - \sigma_{ij})(p_{ij}q(x) + (1 - p_{ij})(q(x) - r)). \tag{8}$$

(iv) **Limited liability constraints**:

$$F_0 \leq w_i - c \tag{9}$$

and

$$F_1 \leq q(x) + w_i - r. \tag{10}$$

5.2 Characterizing the Optimal Contract

Under efficient contracts the fines F_0 and F_1 should be set as high as possible. It is costless to do so since it does not directly affect the payoffs of the supplier and the producer while it relaxes constraints (7) and (8). Using this observation we can combine (9) with (7) and (10) with (8) to write the enforceability constraints as:

$$[1-\tau_{ij}]\, w_i \geq c \tag{11}$$

and

$$[1-\tau_{ij}]\,(w_i + q(x)) \geq r, \tag{12}$$

where τ_{ij} is defined in (1) above. We will refer to the first of these constraints as the collateral constraint and the second as the investor protection constraint.

In a standard agency model with limited liability $\tau_{ij} = 0$. Thus $\tau_{ij} > 0$, represents very simply how limited enforcement affects the contracts that can be written. We will refer to $(1-\tau_{ij})\, w$ as a producer's *effective wealth*, i.e. the component that can be pledged to the supplier in the contract.

We now characterize the optimal contract between producer i and supplier j. To keep the notation simple, we drop the subscripts. It is useful to define

$$v \equiv u + (1-\tau)\, w$$

as the producer's *gross* reservation payoff equal to the sum of his outside option and his effective wealth. In our characterization of optimal contracts v will be the key parameter.

Suppose that the participation constraint (5) and incentive constraint (6) are both binding. Then, substituting one expression into the other and using the definition of v, let us define $f(v)$ such that:

$$\frac{p(f(v))}{p'(f(v))} - f(v) \equiv v. \tag{13}$$

In other words, the level of e that satisfies both the participation and the incentive-compatibility constraints can be solved as a function of v only.

Let $g(v,\gamma)$ be the level of x which equates the marginal product of the input to its marginal cost, γ, when the effort level is determined by (13). Formally $g(v,\gamma)$ is defined by:

$$p(f(v))q'(g(v,\gamma)) \equiv \gamma. \tag{14}$$

Next, define $\bar{v}(\gamma)$ as the level of v such that effort is at the first-best level:

$$e^* = f(\bar{v}(\gamma)). \tag{15}$$

Let

$$\varepsilon(e) \equiv -p''(e)p(e)/\{p'(e)\}^2. \tag{16}$$

This is a measure of the degree of concavity of the function $p(e)$.[11]

Suppose the supplier maximizes his expected profit given by (4) subject only to the incentive constraint (6) and the collateral constraint (11) holding with equality. The effort level and input supply pair (e_0, x_0) will solve:

$$p'(e_0)q(x_0) = 1 + \varepsilon(e_0) \tag{17}$$

$$p(e_0)q'(x_0) = \gamma. \tag{18}$$

Finally, let $\underline{v}(\gamma)$ be the level of the gross reservation payoff such that:

$$e_0 = f(\underline{v}(\gamma)). \tag{19}$$

We are now ready to characterize the optimal contract. Its proof, along with those of subsequent results, can be found in the Appendix.

Proposition 1 *Suppose that Assumption 1 holds and* $\tau \leq [1 + \varepsilon(f(\underline{v}(\gamma)))]^{-1}$, *then the optimal contract when* $\tilde{v} \equiv \max\{\underline{v}(\gamma), v\} < \overline{v}(\gamma)$ *is given by:*

$$\begin{aligned} r &= q(g(\tilde{v},\gamma)) - \frac{1}{p'(f(\tilde{v}))} + (1-\tau)w > (1-\tau)w \\ c &= (1-\tau)w \\ x &= g(\tilde{v},\gamma) < x^*(\gamma). \end{aligned}$$

The corresponding effort level is:

$$e = f(\tilde{v}) < e^*(\gamma).$$

For $v \geq \overline{v}(\gamma)$ *the first-best allocation is attained:* $e = e^*(\gamma), x = x^*(\gamma), r = c = \max\{S^*(\gamma) - v + (1-\tau)w, 0\}$.

[11] For example, for $p(e) = e^\alpha$, $\varepsilon(e) = \frac{1-\alpha}{\alpha}$.

The Proposition shows that the optimal contract has a simple structure. The assumption $\tau \leq [1 + \varepsilon(f(\underline{v}(\gamma)))]^{-1}$ guarantees that the investor protection constraint is not binding in this problem. The collateral level c is set equal to the producer's effective wealth. He then makes an additional payment r to the supplier if the project is successful.

Given our assumption of risk neutrality, the only friction in this framework is limited liability which prevents the supplier from efficiently transferring surplus from the producer. As a result, the trade off is between rent extraction and incentive provision. This governs the choice of r. If the producer has sufficient pledgeable wealth, the first-best can be achieved by making him a full residual claimant (i.e., by setting $r = c$). Otherwise, if the project fails, how much the supplier can recoup is limited by the amount of collateralizable wealth that the producer has. But this means when the project is successful, r will be set higher than c, even though this will reduce incentives to supply effort. A higher r increases the supplier's profit when the project succeeds but reduces the probability of that being the case.

To see this most clearly, suppose markets are competitive and so the suppliers earn zero expected profits. Consequently, they have no rents to extract, thereby minimizing the rent extraction vs. incentive provision trade off. We know that the first-best loan size is $x^*(\gamma)$ and the cost to the lender is $\gamma x^*(\gamma)$. As a result, it would seem that in a competitive market $r = c = \gamma x^*(\gamma)$ would achieve the first-best. But if $\gamma x^*(\gamma) > [1 - \tau] w$ then this is not feasible. So to break even the supplier must set $r > \gamma x^*(\gamma) > c$ which will cause e to fall (and x, by complementarity).

Given this trade-off, v turns out to be a key determinant of the optimal contract. For a given producer, if holding $w(1 - \tau)$ constant, u goes up, less needs to be transferred from him to the supplier. Analogously, holding u constant, if $(1 - \tau)w$ goes up, more can be costlessly transferred from the producer to the supplier. In this model, u and $(1 - \tau) w$ both reduce the rent extraction vs. incentive provision trade off. Hence what matters is v: a producer with reservation payoff u and effective wealth $(1 - \tau) w$ will get the same contract as one with reservation payoff $u - \delta$ and effective wealth $(1 - \tau) w + \delta$ where $\delta > 0$.

For a high enough level of the gross reservation payoff, the first best can be achieved. Let $\bar{v}(\gamma)$ denote the gross reservation payoff level such that for $v \geq \bar{v}(\gamma)$ the first-best allocation is achieved. The producer makes a payment to the supplier which is independent of whether his project succeeds or not, i.e. $r = c$. The producer receives a payoff of $v - (1-\tau)\,w$ while the supplier's payoff is $\max\{S^*(\gamma) - v + (1-\tau)\,w, 0\}$. This will happen when the producer has sufficient wealth. If $w \geq \bar{v}(\gamma)/(1-\tau)$, the first best is always achieved while for $w \geq [\overline{v}(\gamma) - S^*(\gamma)]/(1-\tau)$, then there is *some* range of values of the producer's reservation payoff u for which the first best is achieved.

If the producer does not have enough wealth then the first-best will not be achievable. Therefore, for $v < \bar{v}(\gamma)$ contracts will have the feature that $r > c$ and as a result, $e < e^*$ and $x < x^*$. Moreover, the lower is v, the lower will be e and x as $f(v)$ and $g(v,\gamma)$ are strictly increasing in v.

However, if v is sufficiently low, then the participation constraint (5) will cease to bind. To see this, consider the extreme case where $u = 0$ and $w = 0$. In this case, if the supplier wishes the producer can be offered a contract that gives him an expected payoff of 0 (e.g., by setting $r = q(x)$). But that will not be a profit maximizing choice as the producer will choose $e = 0$. In this case the producer is given an "efficiency utility" $\underline{v}(\gamma)$, i.e. a payoff in excess of his outside option. In the is case the supplier maximizes his expected payoff (4) subject only to the incentive constraint (6) and the binding collateral constraint (11). For $v \leq \underline{v}(\gamma)$, the allocation stays the same.

Let

$$S(v,\gamma) \equiv \begin{cases} S^*(\gamma) & v \geq \bar{v}(\gamma) \\ p(f(v))q(g(v,\gamma)) - f(v) - \gamma g(v,\gamma) & v \in [\underline{v}(\gamma), \bar{v}(\gamma)) \end{cases} \tag{20}$$

be the total surplus in the solution given in Proposition 1. A key property of this is stated as:

Corollary 1: *Total second-best surplus $S(v,\gamma)$ is strictly increasing in v for $v \in [\underline{v}(\gamma), \overline{v}(\gamma)]$. For $v \leq \underline{v}(\gamma)$ it is constant at $S(\underline{v}(\gamma),\gamma)$ and for $v \geq \overline{v}(\gamma)$ it is constant at $S^*(\gamma)$. $S(v,\gamma)$ is everywhere strictly decreasing in γ*

The payoffs of the producer and supplier add up to total surplus, i.e.

$$S(u + (1-\tau)w, \gamma) = \pi + u. \tag{21}$$

From equation (21) define

$$\hat{u} = \hat{u}(\pi, w(1-\tau), \gamma)$$

as the payoff of the producer given a particular value of the supplier's profit.

The next result develops properties of this that are useful later when we study matching and general equilibrium effects in the model.

Corollary 2: *The producer's payoff in a optimal contract $\hat{u}(\pi, w(1-\tau), \gamma)$ is strictly decreasing in γ, and π for $v \in [\underline{v}(\gamma), \overline{v}(\gamma)]$. It is also strictly increasing in $w(1-\tau)$ for $v \in [\underline{v}(\gamma), \overline{v}(\gamma)]$.*

This result implicitly characterizes the constrained Pareto-frontier for the contracting problem and is displayed graphically in Figures 1 and 2.[12] The 45^0 line represents the unconstrained Pareto frontier. Here, for $u \in [0, \underline{u}_0]$ the participation constraint does not bind, and so the frontier is flat for this range.

There are different cases depending the level of wealth. As we observed earlier, there is a critical wealth level for above which the first-best is achievable for $\pi = 0$. This case is depicted in Figure 1. In Figure 2, the wealth level is not high enough for the first-best to be achieved for $\pi = 0$. In Figure 3 we show how, for higher values of w, the constrained Pareto-frontier shifts out.

6 Matching

This section completes the picture by looking at who trades with whom, i.e. we study how suppliers and producers are matched. Let $\mathcal{I}$ denoted the set of producers with typical element $i \in \mathcal{I}$ and $\mathcal{J}$ be the set of suppliers with typical element $j \in \mathcal{J}$. An assignment is described by a function $\mu(i) : \mathcal{I} \to \mathcal{J} \cup \{0\}$ where $\mu(i) = j$ denotes a situation in which producer i is assigned to supplier j and $\mu(i) = 0$ denotes autarky. Associated with any assignment is a cost of inputs and a transactions cost $\left\{\gamma_j, \tau_{i\mu(i)}\right\}_{i\in\mathcal{I}}$ and payoffs $\left\{\pi_{i\mu(i)}, u_{i\mu(i)}\right\}_{i\in\mathcal{I}}$.

We are interested in assignments that are stable. In particular, in a stable assignment, it is not possible for a producer to be re-matched with a different supplier and receive a higher payoff while ensuring the supplier makes non-negative profits. The following result characterizes stable assignments:

[12] In these figures, we draw the surplus function as being concave. It is straightforward to show that this will be the case if $1 + \frac{p'''(e)p'(e)}{\{p''(e)\}^2} \geq 0$ for all $e \in E$, i.e. the degree of concavity of the function $p(e)$ does not decrease too sharply. This ensures that, in the second best, the marginal cost of eliciting effort is increasing in effort.

Proposition 2 *An assignment $\mu(i)$ and associated payoffs $u_{i\mu(i)}$ for all $i \in \mathcal{I}$ is stable if and only if:*

$$S\left(u_{i\mu(i)} + \left(1 - \tau_{i\mu(i)}\right) w, \gamma_{\mu(i)}\right) - u_{i\mu(i)} \geq 0$$

and

$$u_{i\mu(i)} \geq \max_{k \in \mathcal{J}/\{j\}} \left\{ \hat{u}\left(0, \left(1 - \tau_{ik}\right) w, \gamma_k\right) \right\}.$$

The first part says that, given the payoff of the producer, the supplier must make a non-negative profit. The second says that a producer must prefer trading with the supplier to whom he is assigned compared to trading with any other supplier (restricting trades to those where the supplier makes non-negative profits). A stable assignment is therefore constrained Pareto efficient.

Little can be said about stable assignments in general. However, there are two key forces that shape them. First, there is the transactions cost associated with trading with a specific supplier. If τ_{ik} is lower for some k, then a greater fraction of wealth can be collateralized. This will give the supplier an advantage. Second, there is a cost effect. If γ_j is lower, then (other things being equal) a supplier also has an advantage in attracting a producer.

One way to think about the stable assignment above is as a fragmented network economy where trades are relationship-based. Heterogeneity in τ_{jk} is reflective of the strength of supplier-producer ties.

7 Markets and Networks

The analysis in the last section was not specific about the τ_{ij}'s that underpin the matching of producers and consumers. We now introduce the idea of a formal legal system which can be used by any producer supplier pair.[13] This allows for anonymous trade in the sense that any supplier can match with any producer using a transactions cost τ_A. This changes the transactions cost technology in every supplier/producer relationship to:

$$\tau_{ij}^A = \min\left\{\tau_A, \tau_{ij}\right\}.$$

[13] This is similar in spirit to Kumar and Matsusaka (2005).

To affect the allocation at all, the anonymous trading possibility has to be such that $\tau_{ij}^{A} < \tau_{ij}$ for at least some i, j pair.

We now consider what happens as anonymous market trade becomes possible in two stages. First, we hold fixed the assignment and consider the impact on contracting decisions. Second, we allow outside options to change and a potential reassignment of producers and suppliers in response to a lower value of τ_A. These correspond to partial equilibrium and general equilibrium analyses of improving property rights.

7.1 Partial Equilibrium

Suppose that the assignment of producer i to supplier $\mu(i)$ is fixed. Assuming that the outside option of producer i remains unchanged, we consider the effects of introducing a formal legal system. Clearly, it will be optimal to switch to the formal legal system if $\tau_A < \tau_{i\mu(i)}$.

We begin with the case where the outside option was binding when a formal legal system is introduced. We have:

Proposition 3 *(The Efficiency Effect) Suppose that the outside option is binding for producer $i \in \mathcal{I}$ and is unchanged by the introduction of a formal legal system which lowers transactions costs. Then producer i's utility is unchanged while the payoff of supplier $\mu(i)$ is strictly greater. There is an efficiency improvement from the introduction of a formal legal system with more trade in x between the supplier and the producer and an increase in the latter's unobserved effort e.*

Thus all the returns to the introduction of a legal system that permits more efficient contracting accrue to the supplier. However, by permitting the supplier to request more collateral to support trade, there is an efficiency improvement with an increase in the amount of x traded and effort put in by the producer.

We refer to this efficiency effect as *the de Soto effect* since it mirrors precisely the route for property rights that secure collateral to affect the economy emphasized in de Soto (2000). A fall in the transactions cost τ raises the collateral value of a given amount of wealth. This allows the lenders offer a more efficient loan by reducing the spread between repayment and collateral $(r - c)$. This, in turn, causes effort to rise, and by complementarity between x and e, the loan size will rise as as well. As a consequence, expected output will go up too.

We now turn to the case where the outside option was not binding initially. Here we have:

Proposition 4 *(The Predatory Effect). Suppose that the outside option is not binding on producer $i \in I$ before the introduction of a formal legal system which lowers transactions costs. Then producer i is strictly worse off and supplier $\mu(i)$ is strictly better off after the introduction of a formal legal system.*

The intuition is straightforward. When the outside option is not binding, the supplier is offering the producer an "efficiency utility" greater than his outside option. Imperfect property rights protect the producer and allow him to protect his wealth hence increasing that efficiency utility. When property rights are improved, the power of the supplier is effectively increased and he can force the producer to put up more of his wealth as collateral. But this makes the producer worse off. This result shows why one cannot be Panglossian about the impact of property rights improvements and there is a need to examine these effects in a context where outside options are determined endogenously.

In both of these partial equilibrium cases, we would expect the benefits of improved legally enforced property rights that allow greater use of collateral to accrue to suppliers rather than producers. However, this ignores a second (and potentially important) general equilibrium effect whereby the set of trading opportunities are enhanced for producers increasing their outside option. We now turn to this.

7.2 General Equilibrium

We now consider how introducing the possibility of arms-length trade affects stable assignments of producers to suppliers and (relatedly) the outside options of producers. We begin with the following result:

Proposition 5 *There will only be two active suppliers that use the anonymous trading technology, a high cost supplier and a low cost supplier.*

This allows us to focus on a situation where $\gamma_j \in \left\{\underline{\gamma}, \bar{\gamma}\right\}$ where $\underline{\gamma} < \bar{\gamma}$. There is competition between a supplier whose cost of supply is $\underline{\gamma}$ and one with $\bar{\gamma}$ whom we will refer to as the low cost and high cost supplier. The rent that can be earned by the low cost supplier is determined then by the maximum of the outside option created by trading with the high cost supplier using the arms-length transactions cost τ_A, and the option of continuing to trade with an existing supplier.[14]

We characterize the general equilibrium consequences of arms-length trading in terms of two effects: a *reassignment effect* and an *outside option effect*. Suppose that there is an initial assignment $\mu(i)$ and an associated allocation $\left\{u_{i\mu(i)}\right\}_{i\in\mathcal{I}}$ which is conditional on $\left\{\tau_{i\mu(i)}, \gamma_{\mu(i)}\right\}_{i\in\mathcal{I}}$. We now move to an underlying technology $\left\{\tau_{ij}^A, \gamma_j\right\}_{(i\in\mathcal{I}, j\in\mathcal{J})}$. This will result in a possible new stable assignment $\mu^A(i)$ and a new associated allocation $\left\{u_{i\mu^A(i)}^A\right\}_{i\in\mathcal{I}}$.

We first study the reassignment effect giving a sufficient condition for the introduction of arms-length trade to affect the stable assignment.

Proposition 6 *(The Reassignment Effect) Let $\mu(i)$ be a stable assignment under relationship-based trading. Then for all $i \in I$ such that $\tau_A < \tau_{i\mu(i)}$, the stable assignment under arms-length trade has $\mu^A(i) = 1$. Producers who switch to the most efficient supplier trade more x and put in greater effort under arms-length trading.*

This says that, if the quality of enforcement under arms-length trading is better than under relationship-based trading, then the producer will switch to the most efficient supplier. This illustrates one way in which arms-length trading increases competition allowing producers to find more efficient suppliers. Since producers are still able to trade with supplier $\mu(i)$ this makes such producers strictly better off. This also increases output in the economy.

We now turn to the outside option effect which applies to producers who remain assigned to their existing supplier. Here we have:

Proposition 7 *(The Outside-Option Effect) Let $\mu(i)$ be a stable assignment under relationship-based trading. Suppose that for some $i \in \mathcal{I}$:*

$$\hat{u}\left(0, w\left(1-\tau_{i\mu(i)}\right), \gamma_{\mu(i)}\right) > \hat{u}\left(0, w\left(1-\tau_A\right), \gamma_1\right) > u_{i\mu(i)}.$$

Then $\mu^A(i) = \mu(i)$ and $u_{i\mu(i)}^A > u_{i\mu(i)}$. There is now more trade in x between the supplier and producer and an in increase in the latter's effort.

[14] This approach therefore abstracts from the possibility that improving the scope for anonymous trade increase market competition by inducing entry of firms as in Perotti and Volpin (2007). Here, we fix the state of market competition since only the two most efficient market suppliers are active.

This result gives conditions for a producer to capture more of the surplus that he creates when he remains in a relationship-based trading arrangement after the introduction of arms-length trading. It illustrates an important sense in which introducing arms-length trading exerts a competitive effect on relationship-based trades by improving the outside option available to producers in such relationships.

The first inequality in Proposition 7 says that when the supplier makes no surplus, the producer is better off trading with his existing relationship-based match. A necessary condition for this to be the case is that $\tau_{i\mu(i)} < \tau_A$. Now the supplier to whom he is initially assigned can always offer the producer a utility that exceeds the most that he can be offered to trade by the most efficient supplier. The second condition says that the utility of the producer in his initial assignment is less than he would obtain if he traded with the most efficient supplier if the latter made zero profits. In this case the most efficient supplier would be able to bid the producer away from supplier $\mu(i)$. Hence producer i is guaranteed to increase his payoff while continuing to trade with his existing supplier $\mu(i)$ using the option of switching to the most efficient supplier.

The analysis shows that, unlike the more equivocal partial equilibrium effects, general equilibrium effects generally benefit producers and increase expected output. To the extent that these general equilibrium effects are observed, the introduction of legal systems that can support arms-length trades will be associated with increases in efficiency. The most efficient supplier now resembles a market supplier trading on symmetric terms with all producers. However, relationship-based trading can survive as long as the gains in lower transactions costs outweigh the relative inefficiency in supply. But, generally speaking, and in line with evidence, the expansion of arms length trade reduces dependence on networks as trading arrangements.

8 Implications for the Political Economy of Legal Reform

We now apply the framework to considering how economic and political factors interact in the determination of legal reform. The model provides a framework for thinking about this since it gives a precise account of the payoffs for both suppliers and producers both before and after a reform.

To be concrete, suppose that $\tau_A \in \{\underline{\tau}, \bar{\tau}\}$, that all networks have the same supply cost, γ_n, and that each producer is endowed with either a good or bad network opportunity $\tau_{in} \in \{\underline{\tau}, \bar{\tau}\}$. Suppose also that initially all producers can trade at arms-length using the formal legal system where $\tau_A = \bar{\tau}$. As in the last section, markets have two competing suppliers one with $\underline{\gamma}$ and one with $\bar{\gamma}$. We assume that $\gamma_n \geq \bar{\gamma} > \underline{\gamma}$, i.e. networks are less efficient than the least efficient market trade. This says that open competition in markets where arms length-trade is possible allows some potential advantage to all producers.

We consider a legal reform where τ can costlessly be reduced to $\underline{\tau}$. In concrete terms, this could be thought of as a reform which makes it possible for citizens to register ownership of their assets as in the case of the many land-titling programs that we have seen instituted around the globe. While it is artificial to suppose that such a reform could be undertaken costlessly, it allows us to abstract from issues of how the reform is financed. Moreover, the case for blocking a costless reform gives the starkest possible analysis of who gains and who loses.[15]

8.1 Political Economy

As we discussed above, there are a now a number of papers that study legal reforms to support markets. In studying political economy issues in general, there are two steps. First, it is necessary to identify the interests of different groups of citizens over policy given available policy instruments. Second, it is necessary to understand how these interests are represented in policy making.

In this paper, we focus on the determination of a single policy – legal reform. We assume that the government is unable to tax supplier rents.[16] To study political economy issues we will posit two very stylized political systems following Acemoglu and Robinson (2006). The first we refer to as

[15] The analysis focuses on legal reform as the only policy reform. However, the results will highlight possible interactions between legal reform and reforms that increase competition in the market. These have been studied by Caselli and Gennaioli [2006]. In future work, it would be interesting to look at such issues in our setting where $\underline{\gamma}$ is endogenous.

[16] This restriction on tax instruments is important. Besley and Persson (2007) develop an example in which efficient allocation of property rights depends on the extent to which rents are taxable. They show that this is related to the logic of Diamond and Mirrlees (1971) celebrated production efficiency theorem.

autocracy or elite control where the policy decision is made by a supplier. This could either be a network supplier which we shall call the traditional elite or a market supplier whom we call the market elite. Each will decide whether to support reforming the legal system based on whether they profit from doing so.

We contrast elite control with a case where producers hold political power which we will refer to as democracy or grass roots political control. In this case, legal reform will be controlled by producers. Clearly, in the former case political power is more concentrated, whereas in the latter case it is more dispersed. One immediate implication of our set-up is that if a legal reform generates a Pareto improvement, then it will be implemented.[17]

We are interested in two scenarios in terms of competition in markets. In the first of these, there is concentration of market power because one supplier has a lower cost than any other. This is the case where the economic power in a market is concentrated. In the second scenario, there is strong competition between suppliers (i.e. their costs are close together) which we refer to as diffuse economic power. In each case, we are interested in how the economic and political power interact to determine whether the legal reform takes place.

We also consider two variants in terms of the role of networks. In the first, all trade takes place on an arms-length basis in markets. In the second, there is initially some relationship-based trade in networks alongside arms-length trade in markets.

8.2 Arms-Length Trade Only

Suppose first that:

$$\hat{u}\left(0,\left(1-\underline{\tau}\right)w,\gamma_n\right)<\hat{u}\left(0,\left(1-\bar{\tau}\right)w,\underline{\gamma}\right).$$

In this case, everyone trades in the market even though networks have an enforcement advantage. This case is relevant when $\underline{\gamma}$ is significantly below γ_n, i.e., the competitive cost advantage in markets overrides the enforcement advantage of networks.

The payoff of market participants is determined by their outside option. For those with good network options for relationship-based trade,

[17] This is a typical of a wide range of political economy models. In general, a dynamic model is needed to understand why governments will reject a Pareto improvement. See Besley and Coate (1998) and Acemoglu (2003) for further discussion.

this is given by the package $(\gamma_n, \underline{\tau})$. Notice that, since $\gamma_n \geq \bar{\gamma}$, then $\hat{u}\left(0, \left(1-\underline{\tau}\right) w, \gamma_n\right) \leq \hat{u}\left(0, \left(1-\bar{\tau}\right) w, \bar{\gamma}\right)$. Hence, for those producers with poor opportunities for relationship-based trade, the outside option is provided by a high cost arms-length supplier who offers the package $(\bar{\gamma}, \bar{\tau})$. Therefore, the expected payoff of a producer in this environment is given by $\max\left\{\hat{u}\left(0, \left(1-\bar{\tau}\right) w, \bar{\gamma}\right), \underline{v}\left(\underline{\gamma}\right) - \left(1-\bar{\tau}\right) w\right\}$. This includes the possibility that $\underline{v}\left(\underline{\gamma}\right) - \left(1-\bar{\tau}\right) w > \hat{u}\left(0, \left(1-\bar{\tau}\right) w, \bar{\gamma}\right)$ in which case the outside option is not binding.

We now consider what happens if there is a legal reform in this case, i.e. arms length trade is now possible with improved property rights so that $\left(1-\underline{\tau}\right) w$ can be used as collateral.

There are two distinct sub-cases to study. In the first of these, there is strong competition among the arms length suppliers (i.e., $\bar{\gamma} - \underline{\gamma}$ is small) so that:

$$\underline{v}\left(\underline{\gamma}\right) - \left(1-\bar{\tau}\right) w < \hat{u}\left(0, \left(1-\bar{\tau}\right) w, \bar{\gamma}\right). \tag{22}$$

For this case, we have:

Proposition 8 *With strong market competition (i.e. (22) holds), legal reform increases economic efficiency and national income. Moreover all producers and suppliers are better off. Hence with either elite control or grass roots control of policy, the legal reform is adopted under strong market competition.*

With sufficient competition between the market suppliers, suppliers and producers both gain from legal reform. Thus, who has political control does not matter. Before the reform, the outside option is set by the high-cost arms length trader. Since this outside option improves with the legal reform, producers are better off. As shown in the proof of Proposition 8, the low cost supplier is better off as well, even though the outside option of borrowers have gone up. With the more efficient transactions technology, he benefits more than a high cost producer, and so his profits rise at a higher rate than the outside option of the borrower. Since the participation constraint is binding all through, loan size and effort go up, and overall efficiency goes up.

Next we consider what happens with weak competition (i.e., $\bar{\gamma} - \underline{\gamma}$ is large):

$$\underline{v}\left(\underline{\gamma}\right) - \left(1-\bar{\tau}\right) w > \hat{u}\left(0, \left(1-\underline{\tau}\right) w, \bar{\gamma}\right). \tag{23}$$

In this case, at least one group of producers is strictly worse off from the legal reform which improves property rights and the dominant market supplier is strictly better off. We now have:

Proposition 9 *With weak market competition (i.e. (23) holds), legal reform does not increase economic efficiency or national income. Moreover*

1. *With elite control (autocracy), legal reform takes place.*

2. *With grass roots political control (democracy), legal reform is blocked.*

In this case, the absence of competition means that a legal reform which enhances the scope for collateral increases the ability of the dominant market supplier to extract surplus from the producers. This is the predatory effect identified above at work. There is no increase in economic efficiency, just a transfer of surplus from producers to suppliers from improving property rights. Given this conflict of interest between suppliers and producers, political control matters.

It is interesting to observe that in this case, while not changing the main result, the possibility of network trades can protect some producers from the predatory effect of legal reforms. Those producers with good network opportunities may have their outside option set by their network opportunity and hence their utility will not fall when legal reforms are introduced. We explore this possibility next.

8.3 Relationship-Based and Arms-Length Trade: The Role of Traditional Elites

Suppose some form of relationship-based (network) trade is active before the legal reform. This will be true when:

$$\hat{u}\left(0,\left(1-\underline{\tau}\right)w,\gamma_n\right) \geq \hat{u}\left(0,\left(1-\bar{\tau}\right)w,\underline{\gamma}\right).$$

The network suppliers now earn a rent from their better ability to enforce contracts compared to the market.

Once again, there are two sub-cases. If $\gamma_n < \bar{\gamma}$, no one borrows from the high cost arms length supplier. In this case network suppliers have two roles: first, those with network connections will borrow from it, and as in the previous case, they also provide an outside option to those who do not have network connections. If $\gamma_n \geq \bar{\gamma}$, then the only role of networks is to provide the input to those with network connections.

In the latter case, introducing the legal reform leads to the complete elimination of relationship-based trade. This provides a new effect in addition to those in Propositions 8 and 9. More formally:

Proposition 10 *If networks are active before introducing legal reform then: (i) legal reform increases economic efficiency and national income; (ii) all producers are better off; (iii) the network suppliers are worse off while the low cost market supplier is better off. Hence legal reform is adopted under elite rule or democracy, except when network suppliers control policy.*

The low cost market supplier benefits directly vis a vis producers who were already trading with him. For those who were borrowing from the network, he is better off using the argument of Proposition 9, with the network supplier replacing the high cost arms-length trader in the argument.

From a political economy point of view, this case is interesting as it pits two elites against each other. The old elite who extract rents in networks lose from reforms that extend the scope of market trade. The (new) market elites gain. Thus traditional elites will always oppose legal reforms that increase competition.

This modifies the Propositions from the previous section in two ways. First, if market competition is strong, then the presence of strong traditional networks can act as a drag on the development process.[18] This echoes the theme in some earlier work. For example, Bauer (1954, page 41) argues that:

> "Almost every prominent Yoruba, Ashanti and Fanti chief has widespread trading interests, so have many Hausa emirs. In many instances the official attitude has also failed to check, and has at times encouraged, the restrictive aims of sectional interests, possibly for reasons of administrative convenience and because of fear of political unsettlement."

A similar sentiment is echoed by Rajan and Zingales (1998):

[18] See Kranton (1996) and Banerjee and Newman (1998) for alternative treatments of this effect from a non-political economy point of view.

> "Yet there is a fundamental problem with relationship systems, ... namely, their resistance to change. The opacity and collusive practices that sustain a relationship-based system entrench incumbents at the expense of potential new entrants. Moreover, the very lack of transparency also makes it hard for democratic forces to detect all the abuses in the system. This strengthens the hand of incumbents in resisting any reform."

Second, in the case where market competition is weak, then the network cushions those who have good network opportunities from the effects of improving property rights leading to a greater transfer of surplus to the dominant market supplier. That is, networks act as a sort of "security net". This corresponds to the more benign view of networks as consisting of patron-client relationships or mutual insurance groups which arise because of underlying market failures.[19] As Bardhan (2007) puts it:

> "In small face-to-face communities..there are some accepted limits and symbolic actions against the kind of ruthless exercises of power that sometime accompany the cut-throat impersonality of the legal system enforced by the gendarmerie of the state."

Which of these views is correct will, of course, vary from time-to-time and place-to-place. However, the model gives a sense of the sources of heterogeneity in reform experience that we might expect when network trade is important.

8.4 Summary

The results are summarized in Table 1. Taken together, they suggest that whether a reform takes place which strengthens the ability to create collateral depends on an interaction between economic and political power. When arms-length trade is not competitive then producer and supplier interests are in conflict making it important who has political control whereas competitive arms-length trade aligns their interests. There is a sense, therefore, in which competitive markets and reforms to strengthen property rights are complements.[20]

[19] See Fafchamps (1992) for a survey.

[20] Although the mechanism is different, this is similar conclusion to Perotti and Volpin (2007) and Caselli and Genaoili (2006).

The analysis also highlights how legal reform puts the interests of traditional elites whose rents accrue from networks against those of the market elites. Thus it matters to market development in this context which group of elites is politically more powerful.

9 Concluding Comments

It is well-known that using collateral to support trade requires well-defined property rights. This paper has developed a model where producers have limited ability to collateralize their wealth for productive purposes. Their wealth becomes "dead capital" to use de Soto's phrase. The model has permitted us to explore how this limits contracting possibilities and the structure of trade. We have emphasized how commerce will divide between arms-length and relationship-based trade. A necessary condition for markets to dominate networks is that collateral is sufficiently well-developed.

We have used the framework to explore the political economy of reforms to improve property rights. The analysis emphasizes how the extent of market competition matters for who gains and who loses from legal reform. Traditional elites are a potential source of friction as they have an incentive to limit market competition which reduces their rents. Competition in markets creates common interests between producers and suppliers. However, when competition is absent, their interests can diverge.

Wealth heterogeneity has played no role in our analysis. There is, however, a large and rich literature that studies how wealth distribution affects overall efficiency in the presence of borrowing constraints (Aghion and Bolton, 1997, Banerjee and Newman, 1993, Galor and Zeira 1993). In that literature too, there is a friction in the credit market that generates a role for collateral. Poorer individuals are shut off from the credit market as they cannot offer sufficient collateral, and this perpetuates their poverty as they cannot finance profitable investments. In that environment, anything that improves the trading technology will improve efficiency, although the literature focuses more on the role of wealth inequality and redistributive policies as means of eliminating poverty traps.

Our analysis suggests a distinction between a wealth-constrained and an institution-constrained economy. So if wealth levels are very low, then even as $\tau_A \to 0$, markets remain second best since there is insufficient collateral to sustain the first best. In this economy producers are genuinely wealth constrained. This is to be contrasted with a situation where the problem is lack of development of the legal system. This is characterized by a situation in which $w \geq \underline{\gamma} x^* \left(\underline{\gamma}\right)$ while τ is strictly positive. For this case, for high enough τ the first-best is not achieved, and the economy is institution-constrained. In the latter environment, the policy implications are obvious, but in the former environment institutional-reform alone will not make a huge difference. This is the world of dead capital as characterized by Soto (2000).

However, the issues of wealth distribution and institutions are clearly not separable. For example, in the above example where we showed that legal reforms may make producers worse off, we assumed that they are not sufficiently wealthy. Otherwise, their participation constraints are likely to bind even in the pre-reform environment where they are dealing with a monopolistic supplier. Given this, introducing anonymous trading cannot but help them by enabling them to match with the lowest cost supplier. This suggests that the gains from institutional reform are likely to be heterogeneous depending on producer wealth. This suggests potentially important interactions between legal reform, welfare gains and wealth inequality which we leave to future research.

This paper has looked in in detail at one particular institutional issue, the creation of collateral, and the channel through which it works. Even this specific channel can provide a rich analysis. But equally, the paper can make no claim to generality as other aspects of property rights reform need to be assessed on their own merits. A rich agenda of work remains to study further implications of property rights improvements in general equilibrium settings.

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10 Appendix Proofs

Proof of Proposition 1: The proof proceeds in several steps.

Step 1 (i) *At the optimal contract* $r \geq c$. (ii) *If* $r > c$ *under the optimal contract, then* $c = (1-\tau)\,w$. (iii) *If* $c < (1-\tau)\,w$ *under the optimal contract then* $r = c$ *and effort is at the first-best level.*

Proof of Step 1: (i) At the optimal contract $r \geq c$. Suppose not. Consider a small increase in r to $r + dr$ and a small decrease in c to $c + dc$ that keeps the producer's payoff constant. This is feasible: as $r < c$ by assumption, and the collateral constraint (11) requires $c \leq w(1-\tau)$ whereas the investor protection constraint (12) requires $r \leq w(1-\tau) + (1-\tau)q(x)$. As a result the latter constraint cannot be binding. Clearly, this will increase e via the incentive-compatibility constraint. In the exercise, we hold x constant. If the argument goes through with x constant, it will naturally go through when x is adjusted optimally by the supplier. Using the envelope theorem we can ignore the effect of this change on the producer's payoff via e. Then given the expression for the producer's payoff, this is given by

$$p\,(e)\,(dc - dr) - dc = 0.$$

The change in the supplier's payoff is

$$p'(e)\,(r-c)\,de + p\,(e)\,(dr - dc) + dc = p'(e)\,(r-c)\,de$$

as $p\,(e)\,(dr - dc) + dc = 0$ from above. As $r - c$ is negative by assumption, and e goes down (since r goes up and c goes down), this expression is positive and so the supplier is better off, implying a contradiction.
(ii) If $r > c$ under the optimal contract, then $c = (1-\tau_{ij})\,w_i$. Suppose not.

Then it should be possible to increase c by a small amount, and decrease r (this should be feasible as by assumption $r > c$) so as to keep the producer's payoff constant. However, effort will be higher due to the ICC, and therefore, the supplier will be strictly better off, a contradiction. Therefore, (11) will bind, and so $c = (1-\tau_{ij})\,w_i$.

(iii) If $c < (1-\tau_{ij})\,w_i$ under the optimal contract then $r = c$ and so e is at the first-best level. Notice that $r > c$ implies $c = (1-\tau_{ij})\,w_i$ is equivalent to $c < (1-\tau_{ij})\,w_i$ implies $r \ngtr c$. Also by Step 1, $r \geq c$, and so $r \ngtr c$ is equivalent to $r = c$.■

Step 2: For $v \in [0, \underline{v}(\gamma)]$, under the optimal contract $e = e_0 < e^*(\gamma)\,, x = x_0 < x^*(\gamma)\,, r = r_0 > c = (1-\tau)w$.

Proof of Step 2: Given Step 1, using the ICC and assuming that (11) binds, so that $c = (1-\tau)\,w$**,** (and ignoring for the moment the investor protection constraint (12)) the optimal contracting problem between supplier j and producer i can now be written in the following modified form:

$$\max_{\{x,r\}} p(e)(q(x) - \frac{1}{p'(e)}) + (1-\tau)\,w - \gamma x \tag{24}$$

subject to

$$\frac{p(e)}{p'(e)} - e \geq v. \tag{25}$$

As $p(e)$ is strictly concave (Assumption 1(i)), $p(e) > ep'(e))$ for all $e > 0$ and so, rearranging terms, $p(e)/p'(e) - e > 0$ for all $e > 0$. Also, due to strict concavity of $p(e)$, it follows directly upon differentiation that $p(e)/p'(e) - e$ is strictly increasing for $e > 0$ (its slope is $\varepsilon(e) > 0$ for all $e > 0$) This implies that the participation constraint will not bind for low values of v. In this case, we get the solution in (17) and (18). Given the definition of $\underline{v}(\gamma)$ from (19), and as $\frac{p(e)}{p'(e)} - e > 0$ for all $e > 0$, it follows that $\underline{v}(\gamma) > 0$.

From the ICC, $r_0 = q(x_0) - \frac{1}{p'(e_0)} + (1-\tau)\,w$. We need to check that this does not violate the investor protection constraint (12). We require that:

$$\begin{aligned}(1-\tau)\,(q\,(x) + w) &\geq r \\ &= q\,(x) - \frac{1}{p'\,(e)} + (1-\tau)\,w\end{aligned}$$

or

$$[p'\,(e)\,q\,(x)]^{-1} = [p'\,(f\,(\underline{v}\,(\gamma)))\,q\,(g\,(\underline{v}\,(\gamma)\,,\gamma))]^{-1} \geq \tau. \tag{26}$$

Using (17) this requires $\tau \leq [1+\varepsilon(f(\underline{v}(\gamma)))]^{-1}$ which is what we assume.

It immediately follows that $e_0 < e^*$. Otherwise, if $e_0 = e^*$ from (18), $x = x^*(\gamma)$ but this contradicts (17). The ICC can be rewritten as, using (17):

$$r_0 = \frac{\varepsilon(e_0)}{p'(e_0)} + (1-\tau)\,w.$$

As $\varepsilon(e) > 0$ (by Assumption 1), $r_0 > c$.

The same result holds for all $v \in [0, \underline{v}(\gamma)]$, given that the PC will not bind in this interval. Hence the result follows.■

Now we turn to characterizing the optimal contract for $v \geq \underline{v}(\gamma)$. First we show that the investor protection constraint can be ignored under our assumptions for all $v \geq \underline{v}(\gamma)$.

Step 3: *Suppose that* $\tau \leq [1+\varepsilon(f(\underline{v}(\gamma)))]^{-1}$, *then the investor protection constraint (12) does not bind* for $v \geq \underline{v}(\gamma)$.

Proof of Step 3: We require that

$$[p'(f(v))\,q(g(v,\gamma))]^{-1} \geq \tau \tag{27}$$

for $v \geq \underline{v}(\gamma)$. We show that the left hand side of this inequality is increasing in v. Differentiating with respect to v and using the expressions for $f'(v)$ and $g_v(v,\gamma)$ we find that

$$\frac{d\,[p'(f(v))q(g(v))]}{dv} = -\frac{(p'(e))^2}{p(e)}\frac{(q'(x))^2}{(-q''(x))}\left[\frac{q''(x)q(x)}{\{q'(x)\}^2}\cdot\frac{p''(e)p(e)}{\{p'(e)\}^2} - 1\right] \tag{28}$$

where all expressions are evaluated at $e = f(v)$ and $x = g(v,\gamma)$. By Assumption 1 (iv), the term in square brackets is positive and so the above expression is negative and so the left hand side of (27) is increasing as required. So $\tau \leq$

$[1+\varepsilon\left(f\left(\underline{v}\left(\gamma\right)\right)\right)]^{-1}$ is sufficient for the investor protection constraint to hold for all $v > \underline{v}\left(\gamma\right)$.

Step 4: For $v \in \left[\underline{v}\left(\gamma\right), \overline{v}\left(\gamma\right)\right]$ the optimal contract is characterized by:

$$\begin{aligned}
r &= q(g(\tilde{v},\gamma)) - \frac{1}{p'(f(\tilde{v}))} + (1-\tau)\,w > (1-\tau)\,w \\
c &= (1-\tau)\,w \\
x &= g(\tilde{v},\gamma) < x^*\left(\gamma\right) \\
e &= f(\tilde{v}) < e^*\left(\gamma\right).
\end{aligned}$$

Proof of Step 4: Recall the definition of $\overline{v}(\gamma)$:

$$\overline{v}(\gamma) \equiv \frac{p(e^*\left(\gamma\right))}{p'(e^*\left(\gamma\right))} - e^*\left(\gamma\right)$$

where $e^*\left(\gamma\right)$ is the first-best effort level (characterized by (2) and (3)). Given Step 2, clearly $e^*\left(\gamma\right) > e_0$ and correspondingly, $\underline{v}\left(\gamma\right) < \overline{v}\left(\gamma\right)$. When the PC binds for $v \geq \underline{v}\left(\gamma\right)$ we have

$$\frac{p(e)}{p'(e)} - e = v.$$

Recall that the slope of the left-hand side is $\varepsilon(e) > 0$ for all $e > 0$. Given that e is determined by the binding PC, the supplier's choice of x is given by

$$p(e)q'(x) = \gamma.$$

It is readily verified that:

$$\frac{dx}{de} = \frac{\gamma p'(e)}{\{p(e)\}^2\{-q''(x)\}} > 0.$$

As $\frac{dx}{de} > 0$, $g_v = \frac{dx}{de}f'(v) > 0$. It is straightforward to verify that $g_\gamma\left(v,\gamma\right) < 0$.

From the ICC

$$r = q(g(v)) - \frac{1}{p'(f(v))} + (1-\tau)\,w.$$

As $\underline{v}(\gamma) > 0$ and $f(v)$ is strictly increasing, for $v \geq \underline{v}(\gamma)$ the PC will bind. ■

Step 5: For $v \geq \overline{v}(\gamma)$ the first-best allocation is attained: $e = e^*(\gamma), x = x^*(\gamma), r = c = \max\{S^*(\gamma) - v + (1-\tau)w, 0\}$.
Proof of Step 5: For $v \geq \overline{v}(\gamma)$, the first-best allocation will be chosen by the supplier simply given the fact that it is feasible, and so by definition it will maximize the supplier's payoff subject to providing the producer a gross payoff of v. Obviously now $r = c < (1-\tau)w$ to reflect that the producer has to be given more surplus.■

This completes the proof of Proposition 1.■

Proof of Corollary 1: To characterize the constrained Pareto-frontier, observe that

$$\frac{\partial S}{\partial v} = (p'(v)q(g(v,\gamma)) - 1)\, f'(v).$$

For $v \geq \overline{v}$, $p'(e^*)\, q(x^*(\gamma)) = 1$ and also, $f(v) = f(\overline{v})$. Therefore, $\frac{\partial S}{\partial v} = 0$. For $v < \overline{v}$, $p'(v)q(g(v,\gamma)) > 1$ and as $p(e)/p'(e) - e$ is increasing in e, $f'(v) > 0$ and so $\frac{\partial S}{\partial v} > 0$. In the case where the participation constraint does not bind, we have $p'(e_0)q(x_0) = 1 + \varepsilon(e_0)$. Also, differentiating (13) we obtain $f'(v) = \frac{1}{\varepsilon(e)}$. Therefore, for $v \leq \underline{v}(\gamma)$, $\frac{\partial S}{\partial v} = 1$. To check that $S(v,\gamma)$ is decreasing in γ, differentiate to verify that:

$$\frac{\partial S}{\partial \gamma} = (p(f(v))q'(g(v,\gamma)) - \gamma)\, g_2(v,\gamma) - g(v,\gamma) = -g(v,\gamma)$$

by the envelope theorem. This completes the proof. ■

Proof of Corollary 2: From the definition of $\hat{u}$, and using Corollary 1:

$$
\begin{aligned}
\frac{\partial \hat{u}}{\partial \gamma} &= \frac{\frac{\partial S}{\partial \gamma}}{1-\frac{\partial S}{\partial \gamma}} < 0 \\
\frac{\partial \hat{u}}{\partial \pi} &= -\frac{1}{1-\frac{\partial S}{\partial v}} < 0 \\
\frac{\partial \hat{u}}{\partial \left(w(1-\tau)\right)} &= \frac{\frac{\partial S}{\partial v}}{1-\frac{\partial S}{\partial v}} > 0.
\end{aligned}
$$

■

Proof of Proposition 2: Sufficiency follows routinely from observing that the first condition requires says that the supplier makes a non-negative payoff while the second condition says that the producer prefers his assignment to writing a contract with any other supplier. To show necessity, suppose that $u_{i\mu(i)}$ is unstable for some $i \in \mathcal{I}$. Then there exists $k \in \mathcal{J} \cup \{0\}$ and $\pi_{ik} \geq 0$ such that

$$\hat{u}\left(\pi_{ik}, (1-\tau_{ik})\, w, \gamma_k\right) > u_{i\mu(i)}.$$

But since:

$$\hat{u}\left(0, (1-\tau_{ik})\, w, \gamma_k\right) \geq \hat{u}\left(\pi_{ik}, (1-\tau_{ik})\, w, \gamma_k\right)$$

then the second condition in the Proposition must be violated.■

Proof of Proposition 3: This follows directly from the Corollary 1: $S(v, \gamma)$ is increasing in v and v is increasing in τ. Since the outside option of the producer is unchanged, the supplier receives all the gain in surplus.■

Proof of Proposition 4: The payoff of producer i is determined from:

$$u_{i\mu(i)} = \underline{v}\left(\gamma_{i\mu(i)}\right) - \left(1 - \tau_{i\mu(i)}\right) w$$

which is clearly decreasing in $\tau_{i\mu(i)}$.■

Proof of Proposition 5: This follows directly from the standard argument in Bertrand-type models with heterogeneous costs, homogeneous products and no capacity constraints.■

Proof of Proposition 6: The first part follows directly from Proposition 2. The second part follows from Proposition 1. ■

Proof of Proposition 7: This follows directly from Proposition 1.■

Proof of Proposition 8: Before the reform, the PC is binding with the outside option being set by the high-cost arms length trader at $\hat{u}\left(0,\left(1-\bar{\tau}\right)w,\bar{\gamma}\right).$ The only parties whose payoffs will be affected by the reform are the low cost arms length trader and the producers. Since the reform will improve the outside option of producers $\left(\hat{u}\left(0,\left(1-\underline{\tau}\right)w,\bar{\gamma}\right)>\hat{u}\left(0,\left(1-\bar{\tau}\right)w,\bar{\gamma}\right)\right)$ they are better off. We show that the low cost supplier will be better off as well. Let π be defined by:

$$\hat{u}\left(\pi,\left(1-\tau\right)w,\underline{\gamma}\right)=\hat{u}\left(0,\left(1-\tau\right)w,\bar{\gamma}\right)\equiv\hat{u}.$$

This is equivalent to

$$\pi=S\left(\hat{u}+\left(1-\tau\right)w,\underline{\gamma}\right)-S\left(\hat{u}+\left(1-\tau\right)w,\bar{\gamma}\right).$$

Now observe that:

$$\frac{\partial\pi}{\partial v}=S_1\left(v,\underline{\gamma}\right)-S_1\left(v,\bar{\gamma}\right)$$

which is positive if $S_{12}\left(z,\gamma\right)<0.$ This indeed is the case as using the envelope theorem, we have:

$$S_2\left(v,\gamma\right)=-g\left(v,\gamma\right)$$

and

$$S_{12}\left(v,\gamma\right)=-g_1\left(v,\gamma\right)<0.$$

Therefore, $\partial\pi/\partial v>0.$

Let π' and π'' be defined by:

$$\hat{u}\left(\pi',\left(1-\bar{\tau}\right)w,\underline{\gamma}\right)=\hat{u}\left(0,\left(1-\bar{\tau}\right)w,\bar{\gamma}\right)\equiv\hat{u}'$$

and

$$\hat{u}\left(\pi'',\left(1-\underline{\tau}\right)w,\underline{\gamma}\right)=\hat{u}\left(0,\left(1-\underline{\tau}\right)w,\bar{\gamma}\right)\equiv\hat{u}''.$$

As $\hat{u}(0,(1-\underline{\tau})w,\bar{\gamma}) > \hat{u}(0,(1-\bar{\tau})w,\bar{\gamma})$, $\hat{u}' < \hat{u}''$. Given $S_{12}(v,\gamma) < 0$, therefore,

$$\begin{aligned} & S\left(\hat{u}'+(1-\bar{\tau})w,\underline{\gamma}\right)-S\left(\hat{u}'+(1-\bar{\tau})w,\bar{\gamma}\right) \\ < \ & S\left(\hat{u}''+(1-\underline{\tau})w,\underline{\gamma}\right)-S\left(\hat{u}''+(1-\underline{\tau})w,\bar{\gamma}\right) \end{aligned}$$

i.e., $\pi' < \pi''$.

Finally, since the PC is binding, by Proposition 1, e and x will go up. ■

Proof of Proposition 9: The only parties whose payoffs are affected are the low cost arms-length trader and the producers. The former is strictly better off while the latter are strictly worse off with the reform. The loan size and hence effort does not change when the PC does not bind, and so economic efficiency is not affected.■

Proof of Proposition 10: This is straightforward and hence is omitted. ■

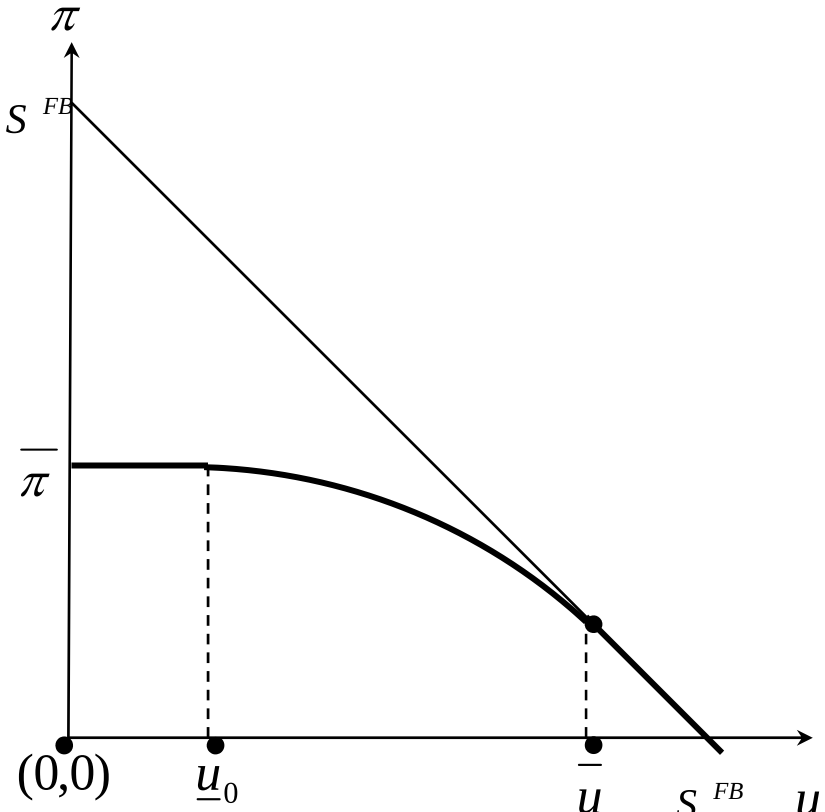

Figure 1

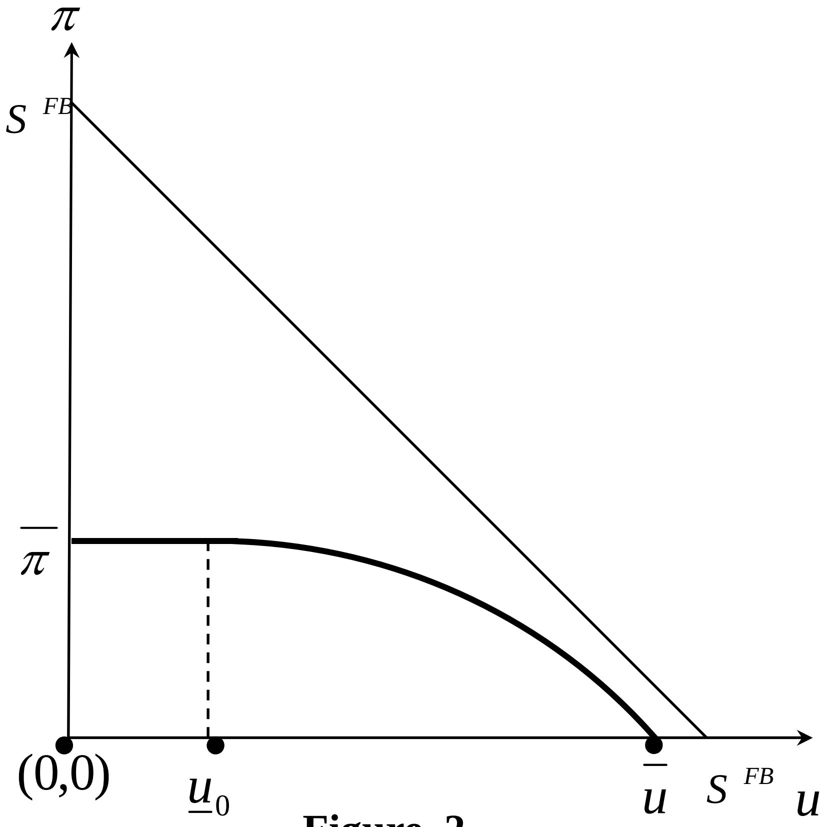

Figure 2

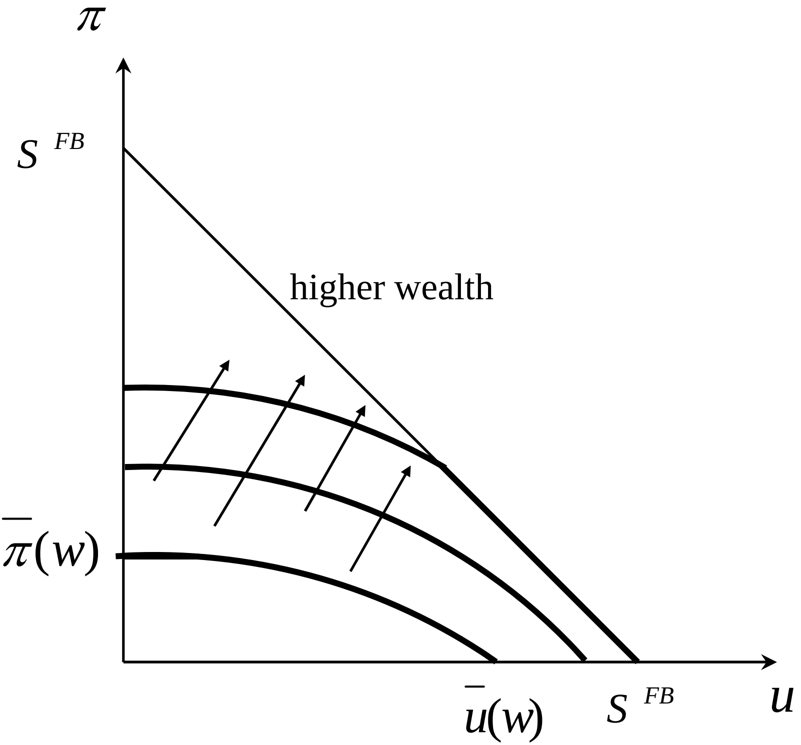

Figure 3

Table 1: Reform Prospects

	Markets	
Form of Government	**Competitive**	**Monopoly**
Democracy (producer control)	Reform	No Reform
Autocracy (market elite control)	Reform	Reform
Autocracy (traditional elite control)	No Reform	No Reform