Endogenous Institutional Selection, Building Trust, and Economic Growth

Aaron L. Bodoh-Creed

University of California*

Abstract

Private-order market institutions founded on trust-based relational contracts suffer adverse selection and moral hazard problems, while public-order market institutions have a limited capacity to enforce contracts. I model agent selection between contract enforcement institutions and demonstrate that the state's contract enforcement capacity is complementary to private-order contract enforcement institutions for low to moderate levels of public-order enforcement capacity. This suggests that initial improvements to public-order institutions cause the accumulation of trust and result in economic growth in both institutions. However, I show that the private-order institution must collapse once the public-order contract enforcement capacity is too great.

1   Introduction

Economic relationships between agents can be governed either by formal contracts enforced by third parties (e.g., sovereign states) or relational contracts that provide incentives through the value participants place on future interactions with the counter-party. When agents commence a relational contract with an unknown partner, each party faces an adverse selection problem if potential partners vary in their ability to sustain an agreement.[1] An agent is *trustworthy* if she is capable of resisting the temptation of moral hazard, and

[1]A firm has a relative advantage at maintaining a relational contract if (for example) the firm has stable management committed to long run profits, can commit to maintaining a presence in a market, and does not suffer from shocks to cost or demand that make moral hazard tempting.

I define the level of *generalized trust* in an economy as the probability that an unknown partner withstands such a temptation and fulfills a relational contract in equilibrium.[2] Trustworthiness is a property of preferences innate to the agent, while generalized trust is an endogenous belief about the behavior of others generated by the equilibrium interaction of individual preferences and the institutional structure of the economy.

A *public-order institution* is a third party enforcement mechanism comprised of the individuals who enforce the laws defining possible public-order contracts.[3] A contractual relationship may exceed the state's enforcement capacity because breach of contract is not verifiable (e.g., transfers based on nonverifiable events) or the contract requires terms that are forbidden by the legal system (e.g., forced labor contracts). Public-order institutions can be improved through the elimination of corruption or increasing the expertise of agents in the judicial system or regulatory bodies. *Private-order institutions* refer to monitoring technologies, reward mechanisms, etc. used in self-enforcing relational contracts between agents incentivized by the shadow of the future. For example, two firms could agree to engage in joint production without a formal contract if violating the contract forecloses future profitable interactions with the counterparty. The critical feature of my model is that agents can choose the institution used to enforce their contracts. For example, firms in developing economies could enforce trade agreements through moderately effective public-order regimes or use relational contracts (McMillan [25]).

I consider an economy in which agents must match with each other in order to produce output. The agents are heterogeneous—some agents are myopic and cannot resist the temptation to defect from an agreement, while other agents are patient and can resist moral hazard. In each period, each agent first chooses whether to enter the public- or private-order institution and is then randomly matched with another agent in that institution. The agents form a contract by choosing the stakes of a prisoner's dilemma game that they play. The contract is enforced in the public-order institution if the stakes are within the contract enforcement capacity of the public-order institution. In the private-order institution, there is a moral hazard problem due to the short-term gains from violating the contracts as well as an adverse selection problem due to agent heterogeneity. The cooperation of patient agents is enforced by the threat of the match being broken, which means the agents would have to find a new partner in the adversely selected pool of potential match partners.

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[2]Generalized trust is a form of social capital that encourages economic growth (Knack and Keefer [21]).

[3]A third party enforcement mechanism is one in which contractual completion is incentivized (potentially through the threat of force) by an agent not party to the agreement.

One might have expected that if the state is more capable of enforcing more profitable contracts, then the outside option for agents in a relational contract is improved and the incentives to maintain a relational contract weaken. This suggests that the contract enforcement institutions are substitutes for one another and that marginal improvements to public-order institutions may reduce the effectiveness of private-order institutions and potentially cause a welfare loss. This logic suggests that reforming public order institutions is best executed with a risky, one-time "Big Push" rather than a series of incremental steps.

The goal of this paper is to highlight the selection of agents into contract enforcement institutions as a channel through which parallel institutions may serve as complements for one another. As the public-order institution becomes more efficient, agents that are incapable of fulfilling a self-enforcing contract in the private-order institution select into the public-order, which ameliorates the adverse selection problem in the private-order institution and increases generalized trust. However, public-order institutions are an outside option for agents that break private-order contracts, and the moral hazard problem in the private-order institution worsens as this outside option improves. At some point the public-order institution will become sufficiently strong that cooperation becomes impossible in the private-order institution even amongst patient agents. Prior to this point, however, the reduction of the adverse selection problem is more powerful than the increasing temptation of moral hazard. Therefore, the private- and public-order contract enforcement institutions are complements as the public-order institution strengthens until suddenly the private-order institution fails entirely.

Section 2 discusses my work in relation to the existing literature, Section 3 describes the model, and Section 4 analyzes the effect of institutional selection on the contract enforcement institutions. Appendices A and B analyze alternative formulations of the model, Appendix C describes extensions to the model, and Appendix D uses my theory to reinterpret the empirical literature on trust and economic development.

2 Related Literature

Most of the prior studies do not focus on the endogenous effect of changes to the public-order institution on the functioning of the private-order institution. Notable exceptions are Aldashev et al. [1] and [2], de Mesquita and Stephenson [26], and Kuran [19].

Aldashev and Johnson [1] and Aldashev et al. [2] model the resolution of an exogenous conflict between an elite member of society and a commoner in the presence of formal

and informal courts. In both papers, agents in the informal system can obtain a ruling from the informal judge, and the disputants can appeal to the formal system to overturn the informal judge's ruling. Both papers emphasize that the informal judges give rulings more favorable to commoners if the formal system does so. Aldashev and Johnson [1] argues that radical reformations of the law may result in no change in informal custom and push the commoners to always appeal to the formal courts. Aldashev et al. [2] shows that the informal community may shrink as the formal judges favor commoners. My focus, the evolution of the economy's development as public-order enforcement improves, is orthogonal to the results of these papers.

de Mesquita and Stephenson [26] present a model of informal networks that interact with a public-order contract enforcement institution that is costly to use. de Mesquita and Stephenson [26] show that lower enforcement costs have no effect on informal networks at first, but these networks eventually shrink and then vanish as costs fall.

Kuran [19] provides a case-study of the *Pact of Umar* in the Middle East, which decreed that conflicts involving a Muslim disputant must be adjudicated under Islamic law, while conflicts between members of the Christian and Jewish minorities could either be adjudicated under Islamic law or through denominational courts. The ability of some agents to choose their contract enforcement institution has obvious links to the model I develop. Kuran [19] argues that in the premodern era, the superior enforcement capacity of Islamic courts incentivized all disputants to seek judgments from these courts. As European legal systems began to recognize new organization forms (e.g., corporations) not allowed under Islamic law, Christian and Jewish merchants chose to use non-Islamic legal systems.

A number of previous papers study private-order enforcement in the shadow of the public-order. Kranton [22] provides a model wherein agents can conduct exchange in either a formal market institution with fiat money or in an informal institution based on reciprocal exchange. Kranton finds that the institutions exert negative externalities on each other and are substitutes. Kvaloy and Olsen [20] model a situation where the agents can make a contract more complete by exerting effort and the public-order institution finds it easier to enforce more complete contracts, but the effect on efficiency of changes to the public-order depends on the contract completion technology. Dixit [9] analyzes a model of public- and private-order enforcement systems working in parallel wherein the public-order enforcement system is capable of perfectly enforcing any contractual agreement once

the fixed cost of implementing the public-order is paid.[4] Because of the nature of the public-order institution studied, Dixit cannot analyze the equilibrium effect of gradual improvements in the contract enforcement capacity of the public-order institution. Sobel [30] provides a model of the interaction of reputational mechanisms with a costly legal system to study the impact of changes in the cost effectiveness of the legal system on the form of long-run relationships in the economy. Adverse selection and the evolution of the form of the relational contract as the public-order institution changes, the focus of my analysis, are not included in Sobel's model. Baker et al. [4] provides a model of relational and formal contracting between firms. The focus of this work is how the choice to integrate can influence the relative effectiveness of these contractual forms.

Several papers discuss how to enforce cooperation in games where the players are anonymously matched to play one-shot games. Ghosh and Ray [13] provides a model wherein pairs of agents form bilateral relationships after being anonymously matched, patient agents screen out impatient agents by slowly increasing their investment in the relationship, and (as in my model) good behavior is enforced by the threat of rematching with a badly behaved partner.[5] Kandori [18] and Ellison [11] study the prisoner's dilemma and provide conditions under which cooperation can be supported through community enforcement by contagion strategies. Deb [6] and Deb and González-Díaz [7] extend these insights to cover a wide class of finite, one-shot games. The recent literature has also explored how cooperation can be supported amongst players connected by a network (e.g., Wolitzky [35], Ali and Miller [3]). Tabellini [31] and Francois and Zabojnik [12] emphasize the positive externalities generated by trustworthy agents, and study the role of socialization in encouraging agents to internalize norms for cooperative behavior.[6]

A number of papers have provided case studies of private-order institutions. Examples include judges at the medieval Champagne fairs (Milgrom et al. [27]), criminal organizations (Dixit [8] and [10], Leeson [23]), trade associations in modern countries (Woodruff [36]), the community responsibility system (Greif [15]), firms in eastern Europe and former Soviet states (Johnson et al. [17]), the New York Diamond Dealer's Club (Bernstein [5]),

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[4]The system analyzed by Dixit bears a resemblance to Li [24], which characterizes relational contracts as low fixed cost, high marginal cost enforcement institutions and public-order contracts as high fixed cost, low marginal cost institutions.

[5]Watson [32] and [33] provides a model wherein a pair of matched agents gradually increase the stakes of a partnership so that "high" types can screen out "low" types. These papers explore different kinds of equilibria that can arise in the model.

[6]It remains an open question whether such behavioral preferences could support agreements of significant size or impersonal agreements between firms.

and the Maghribi traders' coalition (Greif [14]).

3   Model

I model the economy as a repeated game with periods indexed $t \in \{1, 2, ...\}$. There are two types of agents in the economy: untrustworthy, myopic agents ($\delta = 0$) and trustworthy, farsighted agents ($\delta \in (0, 1)$).[7] An agent's type is private information and not observable by other agents. I assume that a measure one continuum of trustworthy agents participates in the economy along with a set of untrustworthy agents of unbounded measure.[8] If an agent's utility in period t is denoted u_t, the agent's intertemporal utility function is:

$$(1 - \delta) \sum_{\tau=0}^{\infty} \delta^{t+\tau} u_{t+\tau}$$

Agents are either *matched* or *unmatched* at the beginning of each period. Unmatched agents have the choice at the beginning of the period as to whether to enter either the public- or private-order institution. How the remainder of the period unfolds for an unmatched agent depends on which institution is chosen. Matched players in either institution know the complete history of their interaction with their current partner and play the prisoner's dilemma game described below.

We discuss the game played by agents that choose to enter the private order institution first. Each agent making this choice is randomly matched in subperiod 1 with another unmatched agent in this institution. I assume that agents are never matched with a previous partner. The fraction of trustworthy agents in the pool of unmatched agents, denoted γ, is determined endogenously in equilibrium by the free entry of agents into the private-order institution. I interpret γ as a measure of generalized trust that describes the probability that counterparties fulfill their agreements.

In subperiod 2, newly matched players (with a generic matched pair denoted i and j) announce contract sizes a_i and a_j. The contract size used throughout agents i and j's

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[7]Although I model the untrustworthy agents as completely myopic, I only require that the untrustworthy agents be less willing or less capable of fulfilling relational contracts than the trustworthy agents. Other modeling choices that would yield qualitatively similar predictions include heterogeneity with regard to the time discount factor (but not total myopia) or to have the untrustworthy agents periodically suffer exogenous shocks to their payoffs that make fulfilling their relational contracts no longer incentive compatible.

[8]Our choice to have an unbounded set of untrustworthy agents is a technical device that relieves us of needing to consider corner solutions in our model of selection between the institutions.

interaction is fixed at $a = \min\{a_i, a_j\}$. I interpret the action a as a relationship specific investment that is fixed for the duration of the partnership. In subperiod 3, the agents play the prisoner's dilemma game described below by independently and simultaneously choosing to cooperate, $c_j^t = 1$, or defect, $c_j^t = 0$.

	$c_j^t = 1$	$c_j^t = 0$
$c_i^t = 1$	$v(a), v(a)$	$l(a), d(a)$
$c_i^t = 0$	$d(a), l(a)$	$0, 0$

The productivity of contracts used in an institution, parameterized by $a \in \mathbb{R}_+$, is our metric for the economic development of that institution. Finally, in subperiod 4 agents i and j choose whether to remain matched next period or re-enter the pool of unmatched agents. The choice to remain matched must be unanimous or both agents enter the pool of unmatched agents. I assume that with probability $1 - \rho \in (0, 1)$ the relationship of two matched agents fails and both agents are forced into the pool of unmatched agents regardless of their intention to stay matched.

The prisoner's dilemma game concisely captures the moral hazard problem facing the agents. I assume that $v(\cdot), l(\cdot)$, and $d(\cdot)$ are differentiable functions. Let $v'(a) > 0$ and $v''(a) \leq 0$. I let defection from the agreement yield $d(a) > v(a)$ for the defector and $l(a) < 0$ for the partner. For mathematical regularity I require $d'(a) > 0$, $l'(a) < 0$, $l''(a) < 0$ and that $d'(0)$ and $l'(0)$ be bounded. I also assume that $d'(a) > v'(a)$, which implies that the returns to defection (relative to cooperation) are increasing in the size of the contract. I let $a = 0$ denote a state of no economic activity wherein $v(0) = d(0) = l(0) = 0$.

I would like to discuss the role of two simplifying assumptions that I make. First, I assume that the contract size is fixed for the duration of a relationship. My assumption that a cannot change as the relationship continues would be problematic if my focus was optimal relational contracts (e.g., Watson [33]) as opposed to the selection between the private and public-order mechanisms. If a more complex model of the private-order relationships is imposed, deriving the continuation value in the private-order institution will become more complicated, but I do not believe the core conclusions regarding institutional selection will change. Second, I also assume that successful relationships can break with an exogenous probability $1 - \rho$. There are several interpretations of this. It could be that with probability $1 - \rho$ some event occurs that is known to both agents and makes it impossible for an agent to fulfill his side of the agreement. Alternately, one might imagine that agents retire from

the market (or "die") with probability $1 - \rho$.[9]

Agents who choose to enter the public-order institution are randomly and uniformly pairwise matched in subperiod 1 with other agents who entered this institution. As in the private-order institution, each agent in the public order institution chooses a contract size in period 2 and plays the prisoner's dilemma game with their assigned partner in period 3. However, if either agent chooses to defect in subperiod 3 (i.e., chooses $c_i^t = 0$), either agent in the pair can submit verifiable evidence of the defection to the sovereign state in subperiod 4. In this event, the sovereign state can enforce a transfer of up to $P > 0$ utils from the agent who chose $c_i^t = 0$ to the other party.[10] The punishment, P, indexes the contract enforcement capacity of the public-order institution. Increasing P corresponds to improving the legal institutions, which could include removing corrupt officials, enhancing the court's ability to verify contractual breach, or increasing the completeness of the contracts. All pairs in the public-order institution are broken at the end of the period.

4 Analysis

I focus on stationary equilibria, so the agents maintain their choice of institution and contract size in all periods. When the agents choose the contract size for their one-shot interaction, they must account for their partner's incentive to defect. The problem of the agents in the public-order institution when they choose their contract size is:

$$G = \max_{a_G \in \mathbb{R}_+} v(a_G) \text{ such that } v(a_G) \geq d(a_G) - P \tag{4.1}$$

I focus my analysis on the payoff maximizing contract size, a_G^*, that satisfies the incentive compatibility constraint of equation 4.1.[11] Noting that $d(a_G) - v(a_G)$ is monotone increasing in a_G, so in a payoff-maximizing equilibrium of this game we have $d(a_G^*) - v(a_G^*) = P$. Since a_G^* is increasing in P, I can conclude $G = v(a_G^*)$ is increasing in P.

The Pareto optimal self-enforcing contract offered by trustworthy agents in the private-order institution solves the **Full Institutional Selection Problem** (FISP) presented below. In any equilibrium, myopic agents in the private-order institution defect in every period. Trustworthy agents cooperate with matched partners and sever matches if their

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[9]The downside to this interpretation is that one has to assume new agents enter to replace the exiting agents, a possibility that I explore in Appendix B.

[10]If both agents defect, the transfers net out to 0.

[11]This is the only public-order contract immune to pairwise deviations by matched partners.

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partner defects at any point in time.[12]

The solution to the FISP maximizes the equilibrium payoffs of the unmatched trustworthy agents. Since newly matched trustworthy agents are the actors who choose the contract size for successfully matched pairs of trustworthy agents, the preferences of these unmatched trustworthy agents is a natural point of reference for defining the objective function.[13] This is also the only equilibrium proof against pairwise deviations of the newly matched partners. Denote the largest maximizer of FISP as a^*.

$$\max_{a \in \mathbb{R}_+} W(a; \gamma) = \max_{a \in \mathbb{R}_+} \gamma \left[(1 - \delta)v(a) + \delta \left(\rho V(a; \gamma) + (1 - \rho)W(a; \gamma) \right) \right] + \quad \text{(FISP)}$$

$$(1 - \gamma) \left[(1 - \delta)l(a) + \delta W(a; \gamma) \right]$$

such that

$$V(a; \gamma) = (1 - \delta)v(a) + \delta \left[\rho V(a; \gamma) + (1 - \rho)W(a; \gamma) \right] \geq \quad \text{(IC1)}$$
$$(1 - \delta) * d(a) + \delta W(a; \gamma)$$

$$W(a; \gamma) \geq (1 - \delta)\gamma d(a) + \delta W(a; \gamma) \quad \text{(IC2)}$$

$$W(a; \gamma) \geq G \quad \text{(LRIC)}$$

$$\gamma d(a) \geq G \quad \text{(SRIC)}$$

The objective function, $W(a; \gamma)$, captures two possible outcomes of a matching. First, the trustworthy agent is matched with a trustworthy partner with probability γ, yielding a current payoff of $(1 - \delta)v(a)$ and a continuation payoff of: $\delta \left(\rho V(a; \gamma) + (1 - \rho)W(a; \gamma) \right)$ where $W(a; \gamma)$ is the value function for unmatched trustworthy agents and $V(a; \gamma)$ is the value function for matched trustworthy agents. The second possible outcome is that the trustworthy agent is matched with an untrustworthy, myopic partner, and earns a current period payoff of $(1 - \delta)l(a)$ and a continuation value of $\delta W(a; \gamma)$.

IC1 requires that matched trustworthy agents prefer to remain in a matched pair at contract level a to defecting and re-entering the pool of unmatched agents. IC2 requires

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[12]The issue of equilibrium existence is trivial in our model. Consider the equilibrium where all agents select into the public-order institution on the equilibrium path. This is supported in equilibrium by all agents offering $a = 0$ if they select into the private-order institution and the off-path-belief that all agents in the private-order institution are untrustworthy. This describes a (weakly) inefficient equilibria for all G, and the unique equilibrium once moral hazard causes the private-order institution to collapse.

[13]Appendix A analyzes the more complex problem wherein the objective function is the payoff of the matched trustworthy agents.

that unmatched trustworthy agents prefer to try to match with another trustworthy agent to defecting and remaining in the pool of unmatched agents. The LRIC condition requires that the trustworthy agents be willing to enter the private-order institution.[14] In the Pareto optimal equilibrium, the only instance in which trustworthy players select into the public order is if there is no a compatible with the constraints that provides a higher payoff than G, in which case the private-order institution is empty.

The SRIC condition captures the incentive constraint of the untrustworthy agents and mediates selection between the institutions when myopic agents are indifferent between them. The SRIC can be thought of as a market clearing condition that determines the endogenous level of generalized trust, $\gamma^*(G)$, the probability of being matched with a trustworthy partner. The untrustworthy agents choose to enter the private-order institution only if the expected payoff from defecting against an unmatched trustworthy agent is (weakly) greater than the payoff from a public-order contract.

The interpretation of SRIC as a market clearing condition makes transparent that my analysis of selection between the institutions does not rely on the details of the game played in either institution. Selection is determined by the endogenous equalization of the payoffs for the untrustworthy agents, however these payoffs are generated, of participating in each contract enforcement institution. For example, if I allowed agents within the private-order institution to build-trust over time as in (for example) Ghosh and Ray [13] or Watson [33], then the payoffs of the myopic agents in the private-order institution would be more complex, but a market clearing condition would still determine selection between the institutions. Moreover, the basic results I find below regarding the positive externality the public-order institution provides the private-order institution would continue to hold.

If there is entry to the private-order institution by any type of agent, then SRIC binds. If SRIC is slack, then all of the myopic agents prefer to enter the private-order institution. Since the measure of the myopic agents is unbounded, the ratio of myopic to patient agents (i.e., γ) is 0, which in turn means that agents in the private-order institution are matched with untrustworthy partners with probability 1 and the payoff to private-order matches is 0.[15] If $G > 0$ this cannot be an equilibrium, meaning that SRIC binds whenever $G > 0$.

The binding SRIC also explains why the patient agents select into the private-order

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[14] "LR" refers to "Long Run," whereas "SR" refers to "Short Run."

[15] I assumed an arbitrarily large measure of untrustworthy agents in the economy. If the measure of myopic agents is bounded, then there is an equilibrium where all agents, myopic and patient, enter the private order institution and the SRIC is slack for $G > 0$ sufficiently small. This is the corner solution referred to in Footnote 8.

institution. Since the patient agents can form effective relational contracts, the payoff of patient agents must be greater than that of the myopic agents in the private-order institution. Since the myopic agents earn G in either institution, the patient agents must strictly prefer to enter the private-order institution. However, there will always be myopic agents in the private-order institution since an adversely selected pool of potential partners (i.e., $\gamma < 1$) is necessary to enforce cooperation among the patient agents.

The endogenous variables G, $\gamma^*(G)$ and $a^*(G)$ describe the equilibrium of my model. One can show that if SRIC binds, then LRIC and SRIC imply IC1 and IC2 (see Appendix C), meaning I can write the FISP as:

$$\max_{a,\gamma \in \mathbb{R}_+} W(a;\gamma) \qquad \text{such that}$$

$$W(a;\gamma) \geq G \tag{LRIC}$$

$$\gamma d(a) = G \tag{SRIC}$$

For sufficiently large G, values of $(a^*(G), \gamma^*(G))$ that satisfy SRIC violate LRIC. This means that for large G, the moral hazard problem destroys the possibility for cooperation even amongst the trustworthy agents in the private-order institution, at which point unmatched trustworthy agents select into the public-order institution. This is summarized in the following proposition.

Proposition 1. *Suppose* $\lim\limits_{a \to \infty} -\frac{l(a)}{d(a)} < \infty$. *Then there exists* $\overline{G} < \infty$ *such that for all* $G > \overline{G}$ *all unmatched agents select into the public-order institution.*

Proof. I will prove that equilibrium values of $W(a;\gamma)$ are bounded, and it follows that there exists $\max\limits_{(a,\gamma)} W(a;\gamma) \leq \overline{G}$ and LRIC cannot be satisfied for $G > \overline{G}$. Note that

$$W(a;\gamma) \leq \gamma \frac{v(a)}{1 - \delta\rho} + (1-\gamma)l(a)$$

From the SRIC condition I have in equilibrium

$$W(a;\gamma) \leq \frac{G}{1 - \delta\rho}\frac{v(a)}{d(a)} + l(a) - G\frac{l(a)}{d(a)}$$

Noting that $l(a) < 0$, $\lim\limits_{a \to \infty} -\frac{l(a)}{d(a)} \leq c$, $\lim\limits_{a \to \infty} \frac{v(a)}{d(a)} < \infty$ since $v(a) \leq d(a)$, and that $v(a)$, $l(a)$, and $d(a)$ are continuous, I have that $W(a;\gamma)$ is bounded in equilibrium. $\qquad\square$

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It is clear that for $\delta, \rho > 0$ sufficiently large and $G > 0$ sufficiently small that I have participation in the private-order institution. I now provide a comparative static result on contract efficiency within this regime, but I require that matched pairs of agents are not exogenously separated with a high probability relative to the discount factor.[16] Since relational contracts are usually durable arrangements, the high ρ case is of interest.

Proposition 2. *For $G < \overline{G}$ and $1 - 2\delta + \delta^2 \rho \geq 0$, $(a^*(G), \gamma^*(G))$ are increasing in G*

Proof. First note that

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\begin{aligned}
W(a; \gamma) &= \left(\frac{1-\delta}{1-\delta\rho} - \delta(1-\gamma) \right)^{-1} (1-\delta) \left(\gamma \frac{v(a)}{1-\delta\rho} + (1-\gamma)l(a) \right) \\
V(a; \gamma) &= \frac{1-\delta}{1-\delta\rho} v(a) + \frac{\delta(1-\rho)}{1-\delta\rho} W(a; \gamma)
\end{aligned}
$$

It is straightforward to show that

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\begin{aligned}
\frac{\partial^2}{\partial\gamma\partial a} W(a; \gamma) &= C^{-2}(1-\delta) \left[\frac{C-\gamma\delta}{1-\delta\rho} v'(a) - (C + \delta(1-\gamma))l'(a) \right] \\
\frac{\partial^2}{\partial a^2} W(a; \gamma) &= C^{-1}(1-\delta) \left(\gamma \frac{v''(a)}{1-\delta\rho} + (1-\gamma)l''(a) \right)
\end{aligned}
$$

where

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C = \frac{1-\delta}{1-\delta\rho} - \delta(1-\gamma)
$$

Given $1 - 2\delta + \delta^2 \rho \geq 0$, these formulas imply that $\frac{\partial^2}{\partial a^2} W(a; \gamma) < 0$ and $\frac{\partial^2}{\partial\gamma\partial a} W(a; \gamma) > 0$ for sufficiently large ρ and $G \in [0, \overline{G}]$.

Suppose that $\gamma^*(G)$ is increasing in G. From $\frac{\partial^2}{\partial a^2} W(a; \gamma) < 0$ and $\frac{\partial^2}{\partial\gamma\partial a} W(a; \gamma) > 0$, I have that $a^*(G)$ is also increasing in G. Consider the opposite case, wherein $\gamma^*(G)$ is decreasing in G. Then $\frac{\partial^2}{\partial a^2} W(a; \gamma) < 0$ and $\frac{\partial^2}{\partial\gamma\partial a} W(a; \gamma) > 0$ implies $a^*(G)$ is decreasing in G. But the SRIC is violated if both $(a^*(G), \gamma^*(G))$ are decreasing in G. Therefore, $(a^*(G), \gamma^*(G))$ must increase with G. $\qquad\square$

Since $a^*(G)$ is increasing in G, the public- and private-order institutions are complementary when the public-order institutions are weak—improvements to the public-order

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[16]The result may continue to hold for small values of ρ, but in these cases the result will turn on the relative magnitudes of $v'(a)$ and $l'(a)$.

institution yield an additional welfare enhancement by increasing the efficiency of contracts in the private-order institution indirectly through the institutional selection channel.[17]

5 Conclusion

Agents have a choice as to which institutions they wish to employ, and the institutions chosen influence the agreements possible in equilibrium. In my model I assume that the payoff to participating in a public-order institution is limited by the state's capacity for enforcing contracts. Contracts within the private-order institution are trust-based and must be equilibria of a contracting game.

Interaction between the private- and public-order institutions is mediated by an adverse selection problem facing the trustworthy agents in the private-order institution. A strong public-order helps draw agents that cannot or will not fulfill relational contracts out of the private-order institution, which alleviates the adverse selection problem in the private-order institution. However, an improved public-order makes defections in the private-order institution more tempting by providing an outlet for agents who cannot or will not fulfill a contract. My analysis shows the benefit of reducing the adverse selection outweighs the harm caused by increased moral hazard when the public-order institution is weak, but a strong enough public-order institution causes the private-order institution to collapse. The initial complementarity of the institutions suggests that the gradual reform of public-order institutions need not hurt the functioning of private-order institutions, so a massive, risky, public-order reform is not necessary to improve economic outcomes.

In Appendix D I use my model to reinterpret the macroeconomic literature on the effect of social capital on economic growth. This literature interprets measures of generalized trust, referred to as social capital, as proxies for the robustness of private-order institutions and uses regression studies to determine the impact of social capital on economic productivity (Knack and Keefer [21]). My model shows that when the interaction between private- and public-order institutions is endogenized, increases in public-order efficiency causes social capital to accumulate. Empirical studies of the impact of social capital on growth can be reinterpreted as demonstrating that social capital acts as a multiplier for the effectiveness of investments in public-order contract enforcement capacity.

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[17]This is similar to Proposition 4 of Ghosh and Ray [13], which implies that an exogenous increase in the fraction of trustworthy agents results in an increase in the payoffs of newly matched agents.

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A   Appendix: Alternate Formulation - For Online Publication

I assumed in Section 4 that the objective function of the institutional selection problem is the welfare of the unmatched trustworthy agents. An alternative formulation of the problem is an economy wherein norms for contract size are determined by the agents in ongoing matches. My constraint simplification argument applies in this setting, so I can write my alternate institutional selection problem as

$$\max_{a \in \mathbb{R}_+} V(a; \gamma) = (1 - \delta)v(a) \quad + \quad \delta\left[\rho V(a; \gamma) + (1 - \rho)W(a; \gamma)\right] \text{ such that}$$

$$W(a; \gamma) \geq G \tag{LRIC}$$

$$\gamma d(a) \geq G \tag{SRIC}$$

The first term of the objective function, $(1 - \delta)v(a)$, captures the present period profits. The second term captures the expected continuation payoff if the match continues, $\rho V(a; \gamma)$, or is exogenously broken, $(1 - \rho)W(a; \gamma)$. Denote the equilibria of this model as $(\gamma_A^*(G), a_A^*(G))$.

Comparative statics in this alternate structure are complicated by the two independent constraints on the objective. As in my prior formulation, for sufficiently large G the private-order institution will collapse as LRIC cannot be satisfied and all agents select into the public-order institution. So long as LRIC does not bind my analysis in Section 4 holds, which implies that $(\gamma_A^*(G), a_A^*(G))$ is increasing in G for sufficiently small G and large ρ.

I can visualize equilibria for a fixed value G when both constraints bind by considering SRIC and LRIC as curves in (a, γ) space as illustrated in Figure 2. Equilibria are represented by the intersection of these lines.

When both LRIC and SRIC bind, I require the implicit function theorem to derive comparative statics. Since SRIC binds it cannot be the case that both $\gamma_A^*(G)$ and $a_A^*(G)$ decrease with G. In addition, since LRIC binds it cannot be the case that $\gamma_A^*(G)$ falls and $a_A^*(G)$ rises with G as $W(a; \gamma)$ would decrease.[18] However, if $d(a)$ has little response to small changes in a at $a_A^*(G)$, it is possible that increasing G is associated with a large decrease in $a_A^*(G)$ and a small increase in $\gamma_A^*(G)$ to satisfy LRIC. Similarly, if $d(a)$ is very responsive to a small change in a at $a_A^*(G)$, a small increase in G could result in a small

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[18]When LRIC weakly binds, the solution is in a regime where $\frac{\partial}{\partial a}W(\gamma_A(G), a)$ evaluated at $a_A(G)$ is negative.
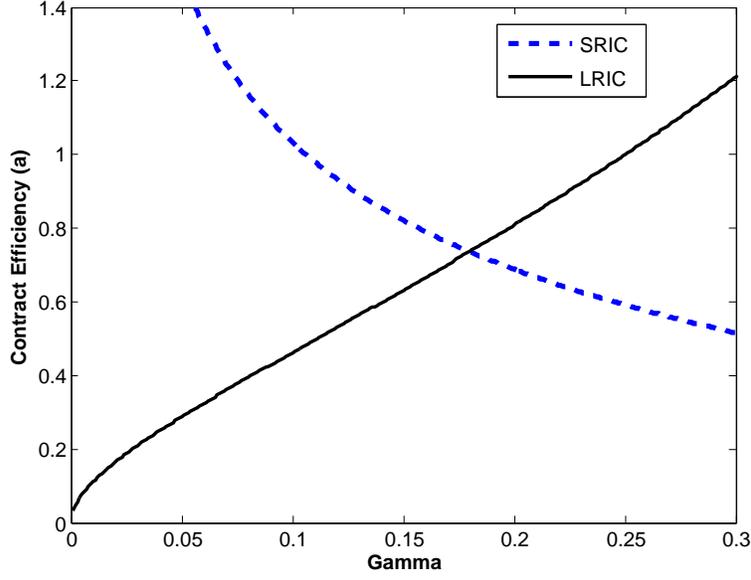
Figure 1: Equilibrium Conditions

decrease in $a_A^*(G)$ and a large increase in $\gamma_A^*(G)$. The third (and most intuitive) possibility is that an increase in G causes an increase in both $a_A^*(G)$ and $\gamma_A^*(G)$.

I use the following notational convention for derivatives

$$\frac{\partial}{\partial a} W(a;\gamma) \triangleq W_a(a;\gamma) = \frac{(1-\delta)}{C} \left[\gamma \frac{v'(a)}{1-\delta\rho} + (1-\gamma)l'(a) \right]$$

$$\frac{\partial}{\partial \gamma} W(a;\gamma) \triangleq W_\gamma(a;\gamma) = \frac{(1-\delta)}{C^2} \left[\frac{C - \gamma\delta}{1-\delta\rho} v(a) - (C + \delta(1-\gamma))l(a) \right]$$

where

$$C = \frac{1-\delta}{1-\delta\rho} - \delta(1-\gamma)$$

The implicit function theorem them yields[19]

$$\frac{\partial a_A}{\partial G} = \frac{d(a) - W_\gamma(a;\gamma)}{d(a) * W_a(a;\gamma) - \gamma d'(a) * W_\gamma(a;\gamma)}$$

$$\frac{\partial \gamma_A}{\partial G} = \frac{W_a(a;\gamma) - \gamma d'(a)}{d(a) * W_a(a;\gamma) - \gamma d'(a) * W_\gamma(a;\gamma)}$$

---

[19]I ignore the requisite rank condition of the implicit function theorem.

with all terms evaluated at $(\gamma_A^*(G), a_A^*(G))$.

To provide structure for my analysis, I examine the case of relationships of infinite duration, $\rho = 1$, and study the limit where the trustworthy players become arbitrarily patient, $\delta \to 1$.[20,21] In this case I can write

$$W_\gamma(a;\gamma) = \frac{(1-\delta)}{C^2}[v(a) - l(a)]$$

$$W_a(a;\gamma) = \frac{(1-\delta)}{C}\left[\frac{\gamma}{1-\delta}v'(a) + (1-\gamma)l'(a)\right]$$

Taking limits I see that

$$\underset{\delta \to 1}{Lim}\ W_\gamma(a;\gamma) = 0$$

$$\underset{\delta \to 1}{Lim}\ W_a(a;\gamma) = v'(a)$$

The limit value of $W_\gamma(a;\gamma)$ reflects the fact that adverse selection, a short run phenomenon, does not significantly influence the incentives of sufficiently patient agents.   The second term reflects the direct effect of increasing a on the welfare of trustworthy agents once they are matched with another trustworthy agent.

My comparative statics in the limit as $\delta \to 1$ can be simplified to

$$\underset{\delta \to 1}{Lim}\frac{\partial a_A}{\partial G} = \frac{1}{v'(a)} > 0$$

$$\underset{\delta \to 1}{Lim}\frac{\partial \gamma_A}{\partial G} = \frac{v'(a) - \gamma d'(a)}{d(a) * v'(a)}$$

I can generate unambiguous comparative statics for $a_A^*(G)$, but my conclusions regarding $\gamma_A^*(G)$ remain ambiguous without specifying my model fully since this term depends on the parameterized indifference condition of the myopic agents.

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[20]Since I have set $\rho = 1$, farsighted players in the unmatched pool will eventually be permanently matched. In the long run the pool of unmatched players will need to be refreshed with entering farsighted agents.

[21]If I reverse the order of limits, then I have a model wherein the agents maximize the average utility ($\delta = 1$) derived from relational contracts with longer and longer expected durations ($\rho \to 1$).   But then $W = V$ and my analysis from Section 3 applies.

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B   Appendix: Endogenous Flow of Agent Types - For Online Publication

The formulation in the body of the paper assumed that all trustworthy agents, a set of finite measure, participate in the private-order institution and a pool of untrustworthy agents divide themselves between the private- and public-order institutions. Without exogenous breakups or entry of new agents, the pool of unmatched agents would empty as pairs of trustworthy agents match. The exogenous break-up of matches between trustworthy agents provides a mechanism for activity to persist in the pool of unmatched agents in the private-order institution in the long run.

An alternative method for insuring participation in both institutions is to assume that matches last forever ($\rho = 1$), but interpret the discount factor as the probability of an agent remaining in the economy next period. With probability δ an agent in the economy stays in the economy the next period, and with probability $1-\delta$ the agent exits the economy and receives utility 0 in all future periods. In this setting a measure λ_{LR} of trustworthy agents enter the economy and a measure $(1-\delta)n_{LR}$ of trustworthy agents leave each period, where n_{LR} denotes the measure of trustworthy agents in the economy in steady state.[22]   Note that:

$$n_{LR} = \frac{\lambda_{LR}}{1 - \delta}$$

Let the measure of trustworthy agents matched with other trustworthy agents equal n_M and the measure of trustworthy agents in the pool of unmatched agents be n_U. Equalizing steady state flows of trustworthy agents between the matched and unmatched sets yields:

$$n_U = \delta n_U + \lambda_{LR} - 2\delta\gamma n_U + 2\delta(1 - \delta)n_M \qquad (n_U)$$

The first and second terms capture the measures of surviving trustworthy agents in and new trustworthy entrants to the pool of unmatched agents. The third term is the measure of surviving trustworthy agents matched in the present period. The fourth term captures entrants to the pool of unmatched agents resulting when exactly one member of a matched pair of trustworthy agents leaves the economy where:

$$n_M = \delta^2 n_M + 2\delta\gamma n_U - 2(1 - \delta^2)n_M \qquad (n_M)$$

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[22]The myopic agents can be represented by a large pool of short lived agents who participate in the economy for one period and then exit.

The first term reflects matched pairs where both agents survive, while the second term captures the measure of newly matched trustworthy agents. The third term is the measure of agents in matched pairs where at least one agent leaves the economy. Equation (n_M) and (n_U) can be solved to determine the steady-state measures of matched and unmatched trustworthy agents.

C Extensions and Additional Results

C.1 Proving IC1 and IC2 are Redundant

Lemma 1. *IC2 implies IC1.*

Proof. To see that IC2 implies IC1, note that IC2 can be written

$$\gamma \left[V(a; \gamma) - (1 - \delta)d(a) - \delta W(a; \gamma) \right] + (1 - \gamma)(1 - \delta)l(a) \geq 0$$

Note that IC1 implies
$$V(a; \gamma) - (1 - \delta)d(a) - \delta W(a; \gamma) \geq 0$$

and by definition $l(a) \leq 0$. Therefore, a failure of IC1 implies a failure of IC2. By contraposition, IC2 implies IC1. □

Lemma 2. *IC2 and SRIC imply LRIC. If SRIC holds with equality, then SRIC and LRIC imply IC2.*

Proof. IC2 can be simplified to

$$W(a; \gamma) \geq \gamma d(a) \geq G$$

where the last inequality follows from SRIC. Therefore IC2 and SRIC imply LRIC. To see the second part of my proposition, note that if SRIC holds with equality I have from LRIC

$$W(a; \gamma) \geq G = \gamma d(a)$$

Reversing the simplification above transforms this into IC2. □

C.2 Extension: Gradual Changes to the Public-Order Institution

One of the goals of my paper is to justify the use of gradual improvements to the public-order institution. Implicitly I assume that a "Big Push" development policy that makes sudden large changes to public order institutions is associated with more risk than a series of smaller institutional changes. If this implicit assumption is true, then the sequence of small changes may be more desirable than a single radical institutional change.[23] However the comparative statics above study different stationary equilibria. What can my model say about situations in which a sequence of future improvements to the public-order institution are anticipated?

Most of my modeling structure remains unchanged with one major exception. Since I have assumed that the choice of a is fixed for the duration of the relationship, trustworthy agents in long-run relationships may eventually desire to break an old relationship in order to recontract in the shadow of an improved public-order. For the purposed of my model, I assume that agents need to find a new partner to form a new contract. This structure captures the idea that different kinds of partners may be required for different levels of a.

I now model the equilibrium given a sequence of public-order enforcement capacities, $(P_1, P_2, ...)$, and let $P_{i+1} > P_i$ so that the public-order institution is improving over time. I assume that the agents understand how the public order-institution will change over time and take this into account when writing their contracts in both institutions. An equilibrium of this dynamic game is defined by sequences of contract sizes for the public- and private-order institutions as well as the degree of generalized trust in the private-order institution in each period. Since I continue to focus on the Pareto optimal equilibria, the contract size within the public-order institution in period t is simply:

$$G_t = \max_{a_G \in \mathbb{R}_+} v(a_G) \text{ such that } v(a_G) \geq d(a_G) - P_t$$

Let the sequence of contract sizes adopted in the private-order institution be denoted $(a_1, a_2, ...)$ with associated levels of generalized trust $(\gamma_1, \gamma_2, ...)$. The problem solved by

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[23]One might fairly argue that time discounting might make a single, fast change at high risk superior to a slow series of low risk changes.

the participants in the private-order institution that have just been matched in period t is:

$$W_t(a_t, \gamma_t) = \max_{a \in \mathbb{R}_+} \gamma_t \left[(1-\delta)v(a_t) + \delta \left(\rho V_t^1(a_t; \gamma_t) + (1-\rho)W_{t+1}(a_{t+1}; \gamma_{t+1}) \right) \right] +$$
$$(1-\gamma) \left[(1-\delta)l(a) + \delta W_{t+1}(a_{t+1}; \gamma_{t+1}) \right]$$

subject to the following constraints:

$$V_t^\tau(a_t; \gamma_t) = (1-\delta)v(a_t) + \delta \rho \max\{V_t^{\tau+1}(a_t; \gamma_t), W_{t+\tau}(a_{t+\tau}; \gamma_{t+\tau})\} + \qquad \text{(C.1)}$$
$$\delta(1-\rho)W_{t+\tau}(a_{t+1}; \gamma_{t+1})$$
$$W_{t+\tau}(a; \gamma) \geq G_{t+\tau}$$
$$\gamma d(a) = G_t$$

The novel aspect of the model is that the payoff from continuing a relationship is nonstationary, which is reflected in the recursive definition of equation C.1. Since P is gradually growing over time, there is a shrinking benefit to continuing a match of age τ that started in period t, captured by $V_t^{\tau+1}(a_t; \gamma_t)$, relative to the benefit of breaking a match and finding a new partner in period $t + \tau$, denoted $W_{t+\tau}(a_{t+\tau}; \gamma_{t+\tau})$. Matched pairs will eventually find it optimal to sever their current relationship to reap the benefits of readjusting the contract size.

The equilibria of my model with foresight regarding future changes to P are qualitatively the same as my earlier model. In particular, raising P increases the contract size in both institutions[24] and increases general trust. The novel feature of my model with foresight is that relationships within the private-order institution can be severed endogenously in order to re-optimize the contract size. I have numerically solved the model with foresight under the same parameters as the simulations above with the resulting equilibrium relationship lengths plotted as a function of P in figure 2. Since P increases over time, I could have equivalently drawn the plot as a function of time.

My numerical results reveal that (under the parameterization chosen) that the maximal relationship length is increasing with the level of public-order contract enforcement capacity. I chose to increase P linearly, so the increase in maximum length of a relationship in the private-order institution is due to the diminishing marginal effect of improvements in

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[24]Recall that G increases with P and, so long as $G < \overline{G}$, this in turn raises the values of a and γ in the private order institution.
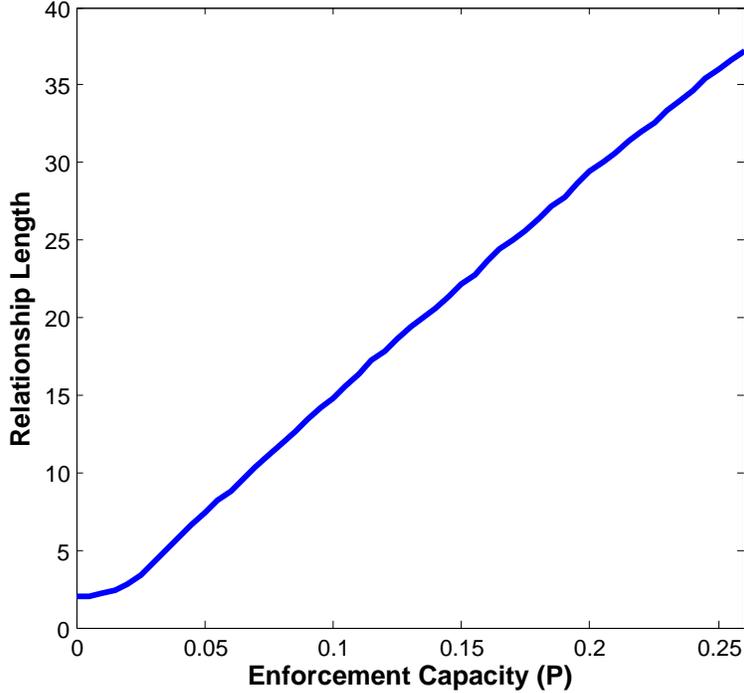
Figure 2: Equilibrium Outcomes

the public-order institution on the efficiency of private-order contracts. In other words, when the public-order institution has only a weak contract-enforcement capacity, small improvements yield large effects on the private-order institution. Therefore, agents will want to re-optimize their contracts regularly. At higher stages of development, the same improvement to the public-order institution yields smaller improvements to the contracts used in the private-order institution. As a result, agents face weaker incentives to re-optimize their contract size at later stages of development.

I have assumed that agents need to break their current match in order to find a partner with whom to re-optimize. While this is fitting with my interpretation of the contract size as a costly, irreversible investment, a natural alternative assumption is that partners can choose to re-optimize their investment within the current relational contract. In my current model, the ability to readjust the size of the contract after learning your partner is trustworthy would increase the value of remaining in the private order institution for the trustworthy agents and lead to the private order institution surviving for higher values of G. However, natural extensions of my model would greatly complicate this story. For

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example, if I assumed that $0 < \delta_{Untrustworthy} < \delta_{Trustworthy} < 1$, then I would have to worry that an untrustworthy agent might be willing to cooperate for a few periods to increase the contract size before finally betraying his or her partner. Complications of this nature in Watson [33] leads to equilibria where the agents slowly ratchet up the size of the contract while gradually screening out untrustworthy agents. I conjecture that dynamics of this form would arise if I allowed agents to reoptimize the size of their contract as time passes. I leave these interesting questions aside as these effects are only loosely related to my primary question about the interaction of public and private order institutions.

C.3 Extension: Externalities from the Private-Order Institution

Private-order institutions often provide other benefits to members, either in parallel markets to the one under consideration or in the form of private benefits and costs to institutional membership. For example the Maghribi traders' coalition was a community founded on a religious institution that provides value to its members apart from the economic interactions the social structure sustains (Greif [14]). I assume that leaving the private-order institution entails losing all associated positive externalities from the underlying social structures. To capture this effect, I extend my model to include a private benefit Δ for trustworthy players that select into the private-order institution. My problem becomes:

$$W(a;\gamma) = \max_{a \in \mathbb{R}_+} \gamma \left[(1-\delta)v(a) + \delta \left(\rho V(a;\gamma) + (1-\rho)W(a;\gamma) \right) \right] +$$
$$(1-\gamma)\left[(1-\delta)l(a) + \delta W(a;\gamma) \right]$$

such that:

$$W(a;\gamma) + \Delta \geq G \quad \text{(LRIC)}$$
$$\gamma * d(a) = G \quad \text{(SRIC)}$$

LRIC can be satisfied for a greater range of G as Δ increases, which expands the set of parameters for which private- and public-order institutions remain complements. Therefore, one would expect that resilient social structures that provide significant private benefits to members ($\Delta > 0$) are promising venues for locating private-order institutions and studying the institutions' efficiency.

One could also model the symmetric case wherein access to the private-order institution

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is an excludable club good for which an entry fee ($\Delta < 0$) must be paid. In this case the entry fees shrink the parameter set for which the public- and private-order institution remain complements, and $W(a; \gamma) - G$ is an upper bound on the fees. A model of this form would imply that a strengthened public-order has a non-monotonic effect on the maximum possible fee for joining such an institution.[25] Therefore one would expect fees such as social strictures and other costs of joining the private-order institution to increase as G rises, but to fade as economic development proceeds.

D   Social Capital, Trust, and Economic Development

Studies have argued that generalized trust, a proxy for social capital, drives economic growth by allowing agents to depend on relational contracts in lieu of less efficient public-order enforcement (Knack and Keefer [21]).[26] A common choice for an international metric of generalized trust is the following World Values Survey question: "Generally speaking, would you say that most people can be trusted or that you can't be too careful in dealing with people?" The World Values Survey trust question tracks $\gamma^*(G)$ if respondents base their reply on the probability that other agents are trustworthy and fulfill their contracts in the private-order institution. Knack and Keefer [21] provides regressions that show a 10 percentage point increase in the trust variable increases the per capita growth rate by 0.8 percentage points, which the authors interpret as social capital causing development and growth.[27]

The challenge for most of the papers attempting to identify a link between aspects of culture or institutions and economic growth is to find a plausible instrument for the endogeneity of the culture/institution. The instruments used by prior work include historical data from hundreds of years in the past (e.g., Tabellini [?]) or biological data such as genetic markers or blood types (Gorodnichenko and Roland [?] and [?]). These instruments effective if (1) they are plausibly correlated with culture in the present and (2) economic growth is not correlated with genetics or events defining the culture hundreds of years in the past.

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[25]Note that $W(a(G); \gamma(G)) - G$ is nonmonotone in G.

[26]This contrasts with models of social capital as participation in organizations or social networks (Putnam [?]) or as an individual investment in the accumulation of social skill and characteristics (Glaeser et al. [?]).

[27]Knack and Keefer [21] use economic performance measured subsequently to the assessment of trust. However, if generalized trust is a dynamic equilibrium phenomenon as in our model, it is not clear that reverse causality is absent.

While the focus of most of the existing papers is determining the effect of culture on economic growth, I am interested in determining the effect of the strength of public institutions on trust, which is a feature of a society's culture. Because elements of culture (e.g., trust) and institutions are both long-run features of society, it is difficult to imagine an effective instrument for my setting. Because of this, I want to emphasize that my regressions of generalized trust on metrics of public-order enforcement capacity should not be given a causal interpretation. I merely hope to use my theory to interpret the findings to illustrate the kind of effects that my theory predicts.

My analysis of the effect of the development of public-order institutions on the effectiveness of private-order contract enforcement suggests that the development of public-order contract enforcement capacity can cause the accumulation of social capital, which implies that social capital acts as a multiplier of the effectiveness of investments in public-order institutions. In effect, development makes the organizations and social capital underlying private-order enforcement more effective. The efficiency of public-order institutions can be increased by reforming a country's legal structure, creating accounting and auditing agents, fighting public-order corruption, and empowering the ability of the state to enforce judgements. Since there is no clear consensus on how to directly reform social norms such as trustworthiness to encourage the accumulation of social capital, my interpretation is an optimistic finding for economic policy in developing and transitional economies as it suggests the accumulation of social capital is an indirect outcome of traditional institutional reform and development programs.

In order to provide an illustration of my prediction that generalized trust, $\gamma^*(G)$, is increasing in public-order contract enforcement capacity, P, I conduct regressions of the country average of the generalized trust measure from the 2005 World Values Survey against a variety of proxies for the strength of the public-order institutions in each nation.[28] Given that enforcing a contract through the public-order institution involves filing a grievance with the legal system (or bargaining in the shadow of such a filing), my proxies focus on the strength and efficiency of the judicial system. The prediction drawn from my model is that each of these proxies for a high public-order contract enforcement capacity will increase the country average trust variable.

These regressions omit a number of conflating factors that have been cited in the literature as influencing social capital such as the presence of hierarchical religions, infant

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[28] A stronger test would also regress a measure of relational contract size, a^*, against metrics for public-order contract enforcement capacity, P. I am unaware of any metrics that capture this variable.

mortality, and infrastructure quality (La Porta et al. [?]); the level of property rights protection (Acemoglu et al. [?]); and taxation and bureaucracy (Friedman et al. [?]). I acknowledge that all of these variables likely play a role in determining a society's level of generalized trust.[29]

Table 1: Summary Statistics

Variables	Mean	Std. Dev.	Min	Max	# Obs.
Enforcement	6.195	1.631	3.5	8.945	45
Law and Order	7.185	2.379	1.67	10	45
Public-Order Corruption	4.989	2.306	1.5	9.3	56
Enforcement Time	514.8	347.2	109	1459	55
% Organization Member	0.496	0.238	0.05	1	45
Civic Norms	30.90	2.407	24	35.5	45
Log GDP	8.171	1.663	4.827	10.53	55

Table 1 presents summary statistics for my variables. My first two proxies for the efficiency of contract enforcement in the public-order institution are drawn from Djankov et al. [?].[30] The **Enforcement** variable indexes the enforceability of contracts, and **Law and Order** indexes the integrity of the legal system in 2000. These index variables are scaled from 0 to 10, and my theory predicts that higher values for these variables are associated with higher levels of generalized trust. My proxy for corruption, **Public-Order Corruption**, is drawn from Transparency International's *Corruption Perceptions Index 2010* (Transparency International [?]). Public-order corruption measures perceptions of a nation's public-order corruption on a 10 point scale (10 being least corrupt) as reported in surveys of country experts and business leaders with experience operating in the nation, and this variable ought to positively influence generalized trust. **Enforcement Time,** measured in days, is drawn from the World Bank's *Doing Business 2007* survey (World Bank [?]). Higher values of this regressor indicate slower, less efficient judicial systems and ought to be associated with lower values of generalized trust.

In addition to the proxies for public-order enforcement capacity, I include two additional metrics of social capital computed from the 2005 World Values Survey. **% Organization Member** is the fraction of the population that is a member of an organization or group.

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[29]To the extent that these factors proxy for the efficiency of the public-order institution, then the influence of these factors on trust (and hence GDP growth) could act through the channel my model describes.

[30]The reader should consult Djankov et al. [?] for complete definitions of these variables. **Enforcement** is the variable "Enforceability of contracts," and **Law and Order** is the variable "Law and order."

Civic Norms measures the extent to which respondents approve of antisocial activities and is scaled between 0 and 40. These two metrics of social capital capture the potential use of social networks and/or internalized social norms as tools to enforce relational contracts by monitoring and punishing defectors. By controlling for these other elements of social capital I hope to isolate the impact of improvements to the public-order institution on generalized trust.

Inclusion of **log GDP** in my regressions provides a control for other institutional innovations that might have increased the efficiency of private-order contracting (and hence increased trust). One example of such an institution is private-order information clearinghouses such as credit rating bureaus, bond rating agencies, and auditing firms. While the services of these agencies are regulated by public-order agencies and may play a role in legal enforcement actions, these clearinghouses play a crucial role in monitoring and disseminating the reputation of actors in the private-order institutions of the economy.

Table 2: Dependent Variable: Trust

Enforcement	0.100**				0.060
	(0.037)				(0.052)
Law and Order		0.034**			0.026
		(0.016)			(0.021)
Public-Order			0.052***		0.015
Corruption			(0.018)		(0.030)
Enforcement Time				-0.001**	-0.0001
				(0.0007)	(0.0001)
% Organization	-0.053	0.138	0.029	0.064	0.062
Member	(0.160)	(0.123)	(0.094)	(0.095)	(0.196)
Civic Norms	0.016	0.011	0.014	0.0144	0.005
	(0.015)	(0.013)	(0.009)	(0.009)	(0.015)
Log GDP	-0.065	0.006	-0.027	0.026*	-0.069
	(0.039)	(0.028)	(0.024)	(0.014)	(0.042)
Intercept	-0.217	-0.433	-0.209	-0.314	0.117
	(0.475)	(0.408)	(0.316)	(0.309)	(0.500)

I first provide regressions that focus on each of my measures independently. All of my variables have the expected sign and are significant at the 5% level. Since I do not wish to take a stand on the relative merits of my different metrics of public order enforcement capacity, I complete my analysis by conducting a regression including all of my measures. In addition, the final regression alleviates the omitted variable bias implicit

in the regressions that focus on individual measures. Although none of the measures are individually significant in my final regression, an F-Test of the measures reveals that the set of metrics is significant at the 5% level.

One objection to my data analysis is that generalized trust as measured by the World Values Survey is not an adequate proxy for $\gamma^*(G)$. An alternative causal story is that societies with efficient judiciaries encourage respondents to claim they trust strangers more readily because respondents are confident that the legal system will induce trustworthy behavior on the part of their counter-parties. Alternative causal stories of this nature highlight the need for concrete, observable proxies for the forms of social capital that encourage efficient relational contracting and economic growth.

I have not found a data source to test my predictions regarding selection between institutions, particularly my suggestion that agents that utilize private-order enforcement are more trustworthy than agents that rely on public-order enforcement institutions. Empirically testing this prediction requires identifying farsighted and myopic agents and assessing when these agents utilize public-order enforcement. One could potentially proxy for firm farsightedness with a model that predicts which firms are likely to shutdown in the near future. Producing a metric of legal system usage is more difficult. For example, firms could make heavy de facto use of public-order institutions by bargaining in the shadow of public-order enforcement. Alternately, I could identify firms using contract enforcement mechanisms outside of the public-order institution, but this is also a daunting task. I leave the identification, collection, and analysis of these metrics as a promising subject for future work.