

Endogenous Enforcement Institutions

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Abstract

We model the State as a self-enforcing agreement over the use of force. Powerful individuals punish violations of contracts and property rights, and, if they shirk or abuse their power, society reverts to a low-production “anarchy” stage. Our model has two implications. First, improvements in coercion move the optimal enforcement system from private ordering, where coercive punishments are not used, to centralized State, where punishments sanction violations by citizens but not by the ruler, to decentralized State, where punishments sanction all violations. Second, in a centralized State, institutions that bind State militias to the law simultaneously reduce the ruler’s temptation not to punish contract violations and his temptation to expropriate citizens; thus, they are more productive than judicial institutions, which reduce the probability of unpunished violations, and hence the amount of punishment to be imposed by the ruler, but have no effect on the ruler’s temptation to expropriate. The model is consistent with the historical correlation between technological advances in coercion and the transition from private to State enforcement, and with the fact that institutional constraints on the Executive affected the long-run economic development of nations more than improvements in judicial institutions (Acemoglu and Johnson 2005). The model also provides a framework for the optimal sequencing of institutional reforms in centralized states: they should focus on the ruler’s binding enforcement constraint (punishment or non-expropriation), and switch to the other constraint only when the initially binding one becomes slack.

Keywords: Enforcement; Punishment; Coercive power; Relational contracts; State.

JEL codes: D23; K42; P37.

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1. Introduction

Coercive power has an ambiguous social role. On one hand, it permits expropriation and theft.¹ On the other hand, it enables punishment of anti-social behavior. This ambiguity has been sometimes described by political economists as “the fundamental political dilemma” (Weingast 1995). In this paper we model the State as a relational contract over the use of coercion, which guarantees that power is efficiently used to enforce contracts and property rights, thus providing individuals with the incentives to invest and trade.

We analyze two State forms, depending on the social allocation of power. In the *centralized State*, power is monopolized by the ruler, who promises to enforce contracts between citizens and to respect their property rights. In the *decentralized State*, power is dispersed among the citizens, who promise to punish each other for violating either contracts or property rights. If anybody reneges on his promises, the State breaks down, and society reverts to a low-production “anarchy” stage forever after.

The theory of relational contracts (Levin 2002, 2003) implies that these two State forms are self-enforcing if the ruler’s and citizens’ temptation to renege on the promised uses of power is smaller than the future gains from cooperation. However, the promised uses of power, and hence the relevant reneging temptations, importantly differ across State forms. In the decentralized State, citizens must punish both contract and property

¹ On the economic theory of conflict and expropriation, and the related literature, see Hirschleifer (2001).

breach by other citizens, so they have a relatively large temptation to shirk on punishment efforts. In the centralized State, the ruler must only punish contract violations, because citizens are powerless and cannot expropriate each other. Hence, the temptation to shirk on punishments is lower than in the decentralized State. At the same time, the ruler is immune from punishment, so he has an additional temptation to use his overwhelming power to expropriate citizens.

Our analysis has two important implications. First, in the centralized State, a self-enforcing social contract must simultaneously motivate the ruler to punish contract breach by the citizens and to respect the citizens' property rights. Since the same social surplus is used to provide the ruler with both types of incentive, this implies that only one of the ruler's self-enforcement constraints (punishment or non-expropriation) will be binding in equilibrium. Thus, institutional reforms that reduce the ruler's temptation to shirk on punishment efforts will not be productive if the expropriation constraint is binding, and viceversa. This result provides a theoretical framework for the optimal sequencing of institutional reforms: such reforms should target whichever self-enforcement constraint (i.e., non-expropriation or punishment) is binding, and switch to the other constraint only when the initially binding constraint becomes slack.

In section 4 of the paper, we expand on this result to compare political and judicial institutions. We find that constraints on the executive power such as constitutions and parliaments, by forcing the ruler to use coercion as mandated by the law, simultaneously relax the ruler's punishment constraint (militias will punish contract violations even against the ruler's will) and his non-expropriation constraint (militias will refuse to

expropriate citizens even if the ruler orders them to do so). On the other hand, institutions that facilitate the judicial verification of contractual breach, such as non-formalistic litigation rules, relax the ruler's punishment constraint (if breach is likely to be detected, low punishments will suffice to deter it), but have zero effect on the non-expropriation constraint. This implies that political institutions limiting the ruler's power always increase efficiency, whereas judicial institutions do so only when the punishment constraint is binding. This prediction is consistent with Acemoglu and Johnson (2005), who show empirically that political constraints on the Executive power have favored the long-term economic development of former European colonies more than reductions in the costs of litigating contracts in court.

The second implication of our model is that it allows us to compare and rank on efficiency grounds enforcement systems that use different punishment methods to insure social order—that is, to conduct a fair “horserace” between enforcement institutions (Gibbons and Rutten 2007). In particular, the model predicts that improvements in the coercion technology should move the optimal enforcement system from private ordering, where coercive punishments are not used and all violations are sanctioned by a withdrawal of future cooperation (Milgrom *et al.* 1990; Greif *et al.* 1994; North *et al.* 2009), to the centralized State, where citizens' violations are sanctioned by coercive punishments while the ruler's violations are sanctioned by cooperation withdrawal, to the decentralized State, where all violations are sanctioned by coercive punishments. Our “horserace” result provides a possible explanation for why, in parallel with the steady technological advances in the use of coercion over history (Blaydes and Chaney 2012; Onorato *et al.* 2012), the medieval private enforcement system known as Law Merchant

has been gradually replaced by State enforcement (Milgrom *et al.* 1990; Masten and Prüfer 2011).²

By modeling the State a self-enforcing agreement on the use of force, our paper reconciles three streams of economic literature. The first stream, on formal contracts, takes coercive enforcement by the State as given, and studies how verification costs drive the choice between different contractual provisions and different rules to define property rights.³ The second stream emphasizes how self-enforcing agreements, which are sustained by the parties' interest in maintaining bilateral or multilateral relationships rather than by the threat of coercion, can generate "order without law".⁴ The third stream focuses on how the State can credibly commit not to use violence in order to expropriate citizens (e.g., Olson 1993; Acemoglu *et al.* 2001, 2002; Acemoglu 2003; North *et al.* 2011).

Our contribution to these literatures is twofold. First, we show that, since coercive enforcement of contracts and property rights by the State is costly, it must be itself part of a self-enforcing agreement. This implies that State enforcement cannot be taken for granted even when breach is perfectly verifiable, and that it is constrained and shaped by the coercion technology and by the social allocation of power.

² Masten and Prüfer (2011) suggest an alternative theoretical explanation for the disappearance of the Law Merchant, according to which the evolution from local to long-distance trade increased the coordination costs of community enforcement. Unlike us, they assume the State's willingness to enforce court rulings via coercive punishments is exogenously given.

³ Exogenous State enforcement is assumed by most works on incentive contracts (e.g., Holmstrom 1979; Holmstrom and Milgrom 1991), incomplete contracts (e.g., Hart and Moore 1988; Battigalli and Maggi 2002), and property rights (e.g., Grossman and Hart 1986; Arruñada 2003; Libecap and Lueck 2011).

⁴ Self-enforcing agreements have been used to study employment contracts (MacLeod and Malcomson 1989; Baker *et al.* 1994; Levin 2002, 2003), inter-firm contracts (Klein 2000; Zanarone 2013), the structure and boundaries of firms (Baker *et al.* 1999, 2002), property rights (Ellickson 1991), and enforcement by markets and communities (Klein and Leffler 1981; Bendor and Mookherjee 1990; Milgrom *et al.* 1990; Greif *et al.* 1994; Dixit 2003a, 2003b; Masten and Prüfer 2011; Hadfield and Weingast 2012a, 2012b). See Dixit (2004), Greif (2006), and MacLeod (2007) for comprehensive reviews of these literatures.

Second, we show that, when the State is centralized and has a monopoly on coercion, the ruler's duties to punish contract violations and to refrain from expropriation of the citizens *interact* and, therefore, should be jointly analyzed, rather than studied in isolation. Depending on the coercion technology, the ruler may be more tempted to shirk on punishments or to expropriate and, therefore, institutions that reduce the need for, and the cost of punishments may matter more or less for a State's stability and development than institutions that limit expropriation. These results relate to a recent empirical literature on the comparative economic effects of institutions (Acemoglu *et al.* 2002; Acemoglu and Johnson 2005), and offer testable predictions that we hope to bring to the data in future work.

Our paper also relates to a recent economic literature on the nature and origin of law (Hadfield and Weingast 2012a, 2012b). In particular, Hadfield and Weingast (2012a) explain standard attributes of the law, such as generality and abstractedness, as means to align the law's content with social preferences, and hence to facilitate collective enforcement by the citizens. We see our paper as complementary to theirs. On one hand, by assuming that enforcement incentives can be provided in monetary form, we abstract from possible distortions in the content of the law. On the other hand, we study the endogenous choice of punishment technology and of the optimal allocation of punishment power, which Hadfield and Weingast take as exogenous.

The rest of the paper is organized as follows. Section 2 presents the model. Section 3 analyzes enforcement via private ordering. Section 4 analyzes centralized and decentralized State enforcement and compares them to private ordering. Section 5 applies the model to observed enforcement institutions. Section 6 concludes.

2. The Model

2.1. Environment and technology

Production

There are two identical principals and two identical agents, all of them risk-neutral. The principals and the agents live forever, and discount next-period incomes at the common factor $1/(1+r)$.⁵ In every period, each principal hires an agent to perform a productive task. By spending effort e on his task, the agent generates utility $V(e)$ for the principal and incurs a cost $C(e)$. We assume that $V(\cdot)$ and $C(\cdot)$ are increasing in e , $V(0)=C(0)=0$, and the net surplus $V(e)-C(e)$ has a unique maximizer $e^{FB} > 0$.

Coercion

There are two identical units of coercive power, which are non-convertible into consumption and are exogenously allocated to the principals.⁶ When power is *centralized*, one principal controls both units, and when it is *decentralized*, each principal controls one unit. A unit of power is composed by a weapon and a soldier, who has been trained to be

⁵ All of the results immediately extend to a model with an arbitrary finite number of non-identical principals and agents. We focus on a symmetric model with two principals and agents to keep the notation as simple as possible.

⁶ It would be easy to consider the case where some power is also allocated to the agents. That would enable the agents to defend themselves against expropriation and, since the agents are the only productive parties in the model, it would increase efficiency. Here, we focus on the most challenging case where the agents are fully exposed to the principals' expropriation threat.

loyal to the principal who controls him.⁷ In section 4.2, we will study institutional constraints that may reduce this personal loyalty of soldiers to their principals.

Coercive power can be used to either *expropriate* or *punish*. Specifically, a principal endowed with at least one unit of coercive power can expropriate a powerless party with success probability ψ , or inflict him a punishment disutility L at cost $k\lambda(L)$, where $\lambda(L)$ is the punishment effort necessary to inflict disutility L , k is the unit cost of punishment effort, and we assume that $\lambda(0) = 0$ and $\lambda'(\cdot) > 0$. A high level of ψ may arise if resources can be consumed or hidden before an expropriatory attack, or if launching an attack is costly (for instance, because soldiers must be equipped and moved). A high unit cost of punishment k may arise if the available coercion technology is not too effective, or if there are exogenous constraints on punishments, such as laws and ethical norms.

Assumptions

We make two assumptions on the expropriation technology. First, we assume wealth can be expropriated only when it is transferred from one party to another via monetary payments. This may occur, for instance, if wealth stocks are sufficiently illiquid and idiosyncratic, so that an expropriator must wait until the wealth has been liquidated by its owner via payments. Second, we assume that a party endowed with coercive power cannot be expropriated, due to his ability to defend himself.

⁷ For instance, Blaydes and Chaney (2012) report that in medieval Muslim States, Mameluch soldiers were trained to be personally loyal to the king. We rule out the possibility that soldiers may attempt a coup against the principal who controls them. For a model where the size of armies is chosen so that there are no coups in equilibrium, see Besley and Robinson (2009).

Our first assumption allows us to focus on the incentive effect of expropriation (if the agents' salary can be expropriated, the agents will spend less effort), while abstracting from its redistributive effect (transfers of wealth stocks across principals and from agents to principals). The assumption can be easily relaxed, at the cost of complicating the model's notation. Our second assumption insures that, if two powerful principals enter a social contract (as in the decentralized State analyzed in section 4.3), they can use welfare-neutral monetary transfers to split the surplus. The reason is that, if transfers cannot be expropriated, their size does not affect the principals' temptation to renege on the social contract. By allowing for surplus-sharing via monetary transfers under all allocations of power, this assumption will help us develop a fair comparison of different enforcement institutions (see, in particular, proposition 5). Regarding the informational structure of the model, we assume that efforts, punishments, expropriation, and monetary payments between the parties are publicly observed.

2.2. Anarchy

Given our assumptions, we can state the following:

Proposition 1: there is a subgame-perfect equilibrium of the repeated game, labeled “anarchy”, where, in every period, the agents spend zero effort, no party transfers wealth to any other party, and the principals do not use their power to punish or expropriate.

Proof: In every period, zero effort is a best response to non-payment, non-expropriation is the only, and hence best, response to non-payment, and non-payment and non-punishment are best responses to zero effort and non-punishment. QED.

Note that, since the agents spend zero effort, the social surplus under anarchy is also zero.

3. Enforcement through private ordering

Since anarchy generates no surplus, it is natural to ask whether more efficient equilibria can be achieved. As a benchmark, we briefly consider the “private ordering” solution studied by Greif *et al.* (1994), where cooperation between the parties is enforced by a threat to interrupt exchange in future periods.

We formally define this as a subgame-perfect equilibrium where, in any given period s , 1) one principal pays a “tax” t to the other principal, 2) each agent spends effort $e \in (0, e^{FB}]$, 3) each agent’s principal rewards him with a bonus b , and 4) neither principal attempts to expropriate the bonus received by the other principal’s agent. If anybody deviates from the equilibrium strategies, all parties revert to anarchy from period $s+1$ and thereafter. We label equilibrium strategies 2) and 3) as “honoring contracts”, and strategy 4) as “respecting property rights”. The only purpose of the tax t is to allow arbitrary divisions of the total surplus between the principals and the agents (MacLeod and Malcomson 1989; Levin 2003).

For private ordering to be a subgame-perfect equilibrium, two sets of conditions must hold. First, the two principals and agents must be willing to initiate and continue in each period the multilateral relationship:

$$V(e) + t - b \geq 0, \tag{1}$$

$$V(e) - t - b \geq 0, \text{ and} \tag{2}$$

$$b - C(e) \geq 0 \text{ for each agent.} \quad (3)$$

Second, each principal must be willing to honor the contract with his agent, and to respect the property rights of the other principal's agent. When power is centralized, this implies:

$$-b + \frac{1}{r} [V(e) + t - b] \geq \psi b \text{ for the powerful principal, and} \quad (4)$$

$$-b + \frac{1}{r} [V(e) - t - b] \geq 0 \text{ for the powerless principal.}^9 \quad (5)$$

When power is decentralized, the incentive constraints become:

$$-b + \frac{1}{r} [V(e) + t - b] \geq \psi b \text{ for the principal who receives the tax, and} \quad (4')$$

$$-b + \frac{1}{r} [V(e) - t - b] \geq \psi b \text{ for the principal who pays the tax.}^{10} \quad (5')$$

Note that (4') is the same as (4) but (5') is more restrictive than (5), so private ordering is more likely to succeed under centralized power. Because our purpose is to use private ordering as a benchmark to assess the value of coercive enforcement by the State (section 4), we focus in the remainder of this section on centralized power, which makes the case for private ordering strongest.

⁹ Assuming that the powerless principal pays the tax to the powerful one is without loss of generality.

¹⁰ The model's results would be unaffected if the principals paid the agents upfront and the agents chose their effort subsequently.

Summing up (1) through (3) yields $V(e) - C(e) \geq 0$, which is satisfied for any effort in the relevant range, $e \in (0, e^{FB}]$. Summing up (4) and (5) and choosing the minimum bonus acceptable for the agents, $b = C(e)$, yields the necessary condition:

$$(2 + \psi)C(e) \leq \frac{1}{r} 2[V(e) - C(e)], \quad (EC^P)$$

where “EC^P” stands for “private-ordering enforcement constraint”. It is easy to check that, when (EC^P) holds, there are values of the tax t such that (1) through (5) also hold, so that (EC^P) is in fact both necessary and sufficient.¹¹ This result is summarized by the following

Proposition 2: under private ordering, the agents’ productive effort, e^P , maximizes the net surplus $V(e) - C(e)$, subject to (EC^P).

Under private ordering, the agents’ effort approaches the first best level e^{FB} when expropriation is difficult (low ψ), and when the parties are patient enough (low r). To illustrate this point, Figure 1 below depicts the level of productive effort under private ordering for low and high values of the expropriation probability ψ .¹²

<<Place Figure 1 here>>

Note that, in the absence of coercive punishments, anarchy – that is, termination of the multilateral relationship – is the strongest credible punishment against deviations (Abreu 1988, Levin 2002). Moreover, given perfect public monitoring, there is no loss of

¹¹ For instance, when (EC^P) holds, (1) through (5) hold for $t = V(e) - (1+r)C(e)$.

¹² In Figure 1, it is assumed that the cost of effort function $C(\cdot)$ is linear.

generality in assuming a stationary equilibrium where the parties' behavior is the same in every period (Abreu 1988; MacLeod and Malcomson 1989).¹³ Hence, the equilibrium described by Proposition 2 is optimal among the class of private ordering equilibria.

4. Coercive enforcement

4.1. Centralized State

We now ask whether the principals and agents can improve on private ordering by creating a *centralized State*, where the powerful principal, called “ruler”, inflicts a coercive punishment L_c to the powerless principal if this violates the contract with his agent. Since the ruler cannot be punished, we assume property violation and non-punishment by the ruler are followed by a reversion to anarchy, as under private ordering. To insure that, as before, zero-sum monetary transfers can be used to split the surplus, we assume that non-payment of the tax by the powerless principal is also followed by reversion to anarchy.

For the centralized State to be a subgame-perfect equilibrium, conditions (1) through (4) must still hold. Condition (5) is replaced by the condition that the ruler's punishment be strong enough to deter contract breach by the powerless principal:

$$b \leq L_c. \tag{6}$$

¹³ Levin (2003) generalizes this point by showing that, if monetary transfers between the parties are observable and unconstrained and the parties are risk-neutral, stationary equilibria are optimal even in the presence of incomplete and imperfect information.

In addition, the ruler must be willing to punish contract breach by the powerless principal:

$$-k\lambda(L_c) + \frac{1}{r}[V(e) + t - b] \geq 0. \quad (7)$$

Let $t = V(e) - b$, $b = C(e)$ and $L_c = b$, so that (2), (3) and (6) hold with equality.

Substituting these values into (1), we obtain the condition $V(e) - C(e) \geq 0$, which holds for $e \in (0, e^{FB}]$. Substituting them into (4) and (7), we obtain the necessary and sufficient conditions:

$$k\lambda[C(e)] \leq \frac{1}{r} 2[V(e) - C(e)], \text{ and} \quad (EC^H)$$

$$(1 + \psi)C(e) \leq \frac{1}{r} 2[V(e) - C(e)]. \quad (EC^V)$$

The notation “ EC^H ” stands for “horizontal constraint”, and determines the ruler’s incentives to punish contract breach by the powerless principal. Likewise, “ EC^V ” stands for “vertical constraint”, and determines the ruler’s incentives to respect both the contract with his agent and the other agent’s property rights. Since the right-hand sides in (EC^H) and (EC^V) are identical, only one of the two constraints is binding. This result is summarized by the following

Proposition 3: in a centralized State, each agent’s productive effort, e^C , maximizes the net surplus $V(e) - C(e)$, subject to whichever constraint is binding between (EC^H) and (EC^V) .

Whether the horizontal or the vertical constraint is binding depends on the coercion technology. Specifically, (EC^H) will be binding when the coercive punishments are costly or ineffective (high k , high $\lambda(\cdot)$), and (EC^V) will be binding when expropriation is likely to succeed (high ψ). To illustrate this point, Figure 2 below depicts the level of productive effort in a centralized State for low and high values of the punishment cost k .¹⁴

<<Place Figure 2 here>>

Proposition 3 has important implications for institutional reforms aimed at improving the functioning of the centralized State, as it predicts that such reforms should solely focus on the binding enforcement constraint. We will return on this point, and discuss some applications, in section 5.

How does the centralized State compare to private ordering on efficiency grounds? Since the right-hand sides of (EC^P) , (EC^H) and (EC^V) are the same, the centralized State dominates private ordering (in the sense that $e^{FB} \geq e^{CS} \geq e^P$) when the left-hand side of the binding constraint among (EC^H) and (EC^V) is smaller than the left-hand side of (EC^P) . Since (EC^P) is tighter than (EC^V) , that occurs if, and only if (EC^P) is looser than (EC^H) , that is, if $k < \frac{(2+\psi)C(e)}{\lambda[C(e)]} \equiv k^{CS}$. This is intuitive: since the centralized State punishes contract violations by the powerless principal via coercion, it will dominate private ordering when coercive punishments are not too costly (low k) and do not require too much effort (low $\lambda(\cdot)$).

¹⁴ In Figure 2 (as in the other figures), it is assumed that the cost of effort and punishment effort functions, $C(\cdot)$ and $\lambda(\cdot)$, are both linear.

4.3. Decentralized State

We now ask whether a decentralized State, where power is equally split among the principals, can do better than the centralized State and private ordering.

In a decentralized State, both principals are in a position to expropriate and punish. Hence, contract breach *and* property breach by one principal are followed by a coercive punishment imposed by the other principal. Formally, this implies that condition (4) from the previous two models is replaced by the condition that punishments be sufficiently tough to deter property breach by the principals:

$$L_e \geq \psi b . \quad (8)$$

Moreover, the punishment credibility condition (7) in the centralized State model must be replaced by the following credibility conditions, one for each principal:

$$-k\lambda (L_c + L_e) + \frac{1}{r} [V(e) + t - b] \geq 0 , \text{ and} \quad (9)$$

$$-k\lambda (L_c + L_e) + \frac{1}{r} [V(e) - t - b] \geq 0 .^{16} \quad (10)$$

Note that, by imposing (9) and (10), we are implicitly ruling out subgame-perfect equilibria sustained by recursive punishment threats – that is, equilibria where one

¹⁶ The principals must also be willing to punish isolated breaches of contracts and isolated breaches of property. We omit these further incentive constraints because they are less restrictive than (9) and (10).

principal's failure to punish is punished by the other principal, and so on.¹⁷ We do so because, while recursive punishments are theoretically possible in the decentralized State, they would require unrealistic beliefs – for instance, that if principal i fails to punish principal j for deviating, he will then believe principal j to “masochistically” punish him in the next period.

Setting $b = C(e)$, $L_c = b$, and $L_e = \psi b$, and summing up (9) and (10) yields the necessary and sufficient condition for the decentralized State to be a subgame-perfect equilibrium:

$$2k\lambda[(1+\psi)C(e)] \leq \frac{1}{r} 2[V(e) - C(e)], \quad (EC^D)$$

where “ EC^D ” stands for “decentralized State constraint”.

This result is summarized by the following

Proposition 4: in a decentralized State, each agent's productive effort, e^D , maximizes the net surplus $V(e) - C(e)$, subject to (EC^D) .

As before, the agents' effort approaches the first best level e^{FB} when the punishment technology is effective (low k , low $\lambda(\cdot)$), when expropriation is difficult (low ψ), and when the parties are patient enough (low r). To illustrate this point, Figure 3 below depicts the outcome of a decentralized State for low and high values of the punishment cost k .

<<Place Figure 3 here>>

¹⁷ For a model where the credibility of coercive punishments hinges on the recursive threat of further punishments, see Hirschleifer and Rasmusen (1989).

Condition (EC^D) is tighter than (EC^H) , so the decentralized State dominates the centralized one if the left-hand side of (EC^D) is smaller than that of (EC^V) , that is, if

$$k < \frac{(1+\psi)C(e)}{2\lambda[(1+\psi)C(e)]} \equiv k^{DS}. \text{ Since } k^{DS} < k^{CS}, \text{ we have the following}$$

Proposition 5: the decentralized State dominates for low punishment costs ($k < k^{DS}$), the centralized State dominates for intermediate punishment costs ($k^{DS} < k < k^{CS}$), and private ordering dominates for high punishment costs ($k > k^{CS}$).

Proposition 5 implies that, as the cost of coercive punishments increases, the optimal enforcement mechanism moves from the decentralized State, which relies on punishments to enforce both contracts and property rights, to the centralized State, which relies on punishments to enforce contracts but not property rights, to private ordering, which does not rely on coercive punishments at all.

Straightforward calculations imply that $\frac{\partial k^{CS}}{\partial \psi} > 0$, and that $\frac{\partial k^{DS}}{\partial \psi} > 0$ if, and only if

$$\varepsilon_\lambda < \frac{1+pq\psi}{q+pq\psi} \equiv \bar{\varepsilon}_\lambda, \text{ where } \varepsilon_\lambda \text{ is the elasticity of the punishment effort } \lambda(\cdot) \text{ with respect to}$$

punishments, evaluated at the decentralized State punishment level.¹⁸ This proves the following

Proposition 6: An improvement in the expropriation technology (higher ψ) favors State enforcement over private ordering and, within State enforcement, it favors the

¹⁸ Formally, $\varepsilon_\lambda = \frac{\lambda'(L_c + L_e)(L_c + L_e)}{\lambda(L_c + L_e)}$, where $L_c = C(e)$ and $L_e = \psi C(e)$ are the decentralized State punishments against contract and property breach, respectively.

decentralized State when the punishment technology is productive enough ($\varepsilon_\lambda < \bar{\varepsilon}_\lambda$), and the centralized State otherwise.

Expropriation is deterred by coercive punishments in the decentralized State, where both principals can punish each other, and by reversion to anarchy in the centralized State, where the ruler is immune from punishments. Therefore, an improvement in the expropriation technology (higher ψ) favors the decentralized State when punishments are productive (high ε_λ), and the centralized State otherwise.

Propositions 5 and 6 can be interpreted and applied in two ways. First, they predict what enforcement system should be observed if the allocation of power (centralized vs. decentralized) and the punishment method (coercive or not) could be efficiently contracted ex ante. While the contractibility of institutions is per se questionable (Acemoglu 2003), the predicted patterns may still be observed, insofar as long-run economic and social forces push for inefficient institutions to be replaced by efficient ones.

Second, given two exogenous and non-contractible enforcement systems, propositions 5 and 6 can predict their comparative performance. Empirically, this can be tested by comparing the economic prosperity of countries that have developed or inherited persistently different enforcement systems, provided that good instruments can be found to measure such systems (Acemoglu *et al.* 2001, 2002; Acemoglu and Johnson 2005).

5. Applications

5.1. Political vs. judicial institutions

Using an instrumental variable approach, Acemoglu and Johnson (2005) estimate how the institutions that former European colonies inherited from their colonizers have affected their economic development. They find that constraints on the Executive power, measured by Gurr's (1999) Polity Index, had a strong positive effect on various development indicators. On the other hand, institutions that facilitate the adjudication of contractual disputes by courts, negatively measured by the degree of judicial formalism, had a far less significant effect.

Our model allows for private contracts between the principals and agents (the exchange of effort e for monetary payment b), and also for the State as a coercion monopolist. Hence, the model is potentially applicable to the setting analyzed by Acemoglu and Johnson (2005). In order to do so, though, we must slightly enrich the model to capture constraints on the Executive power and the degree of judicial formalism.

To model formalism we assume that, according to the State's law, contract breach is punished if and only if it is verified by a court, and that this occurs with probability q . Intuitively, q decreases as the evidence admitted by courts becomes more restrictive, and as the litigation process becomes more cumbersome. We argue that court-verification may be needed despite the fact that efforts and bonus payments are publicly observed because contractual language is imperfect (Battigalli and Maggi 2002), so the players may have different views on whether non-payment of bonus b following effort e

constitutes or not contractual breach, and hence on whether they should or not revert to anarchy if the ruler fails to punish such behavior.¹⁹

To model constraints on the Executive, we assume that, when the ruler orders his soldiers to use coercive power against the law (that is, either in violation of his obligation to punish contract breach or as a means to expropriate), the soldiers obey him with probability p . Our interpretation of parameter p is that, when the State's institutions pose clear and precise limits to the ruler's authority, the soldiers will be more loyal to the State's law than to the ruler's person and, therefore, the probability of "blind obedience" will be lower.²⁰

Given these enrichments, conditions (EC^H) and (EC^V) can be rewritten, respectively, as

$$kp\lambda \left[\frac{C(e)}{q} \right] \leq \frac{1}{r} 2[V(e) - C(e)], \text{ and} \quad (EC^H)$$

$$(1 + p\psi)C(e) \leq \frac{1}{r} 2[V(e) - C(e)]. \quad (EC^V)$$

A decrease in p relaxes both (EC^H) and (EC^V) , whereas an increase in q relaxes (EC^H) only, without affecting (EC^V) . Hence, for intermediate values of the discount rate r , a decrease in p is always productive, whereas an increase in q is productive only if the horizontal constraint is binding – that is, if (EC^H) is tighter than (EC^V) . Moreover, it

¹⁹ The idea that, for citizens to react against the ruler, there must be a consensus on what constitutes ruler's violation, and that institutions help reach such consensus, has been advanced by Weingast (1995).

²⁰ Consistent with our modeling, Blaydes and Chaney (2012) report that in medieval European States, parliaments and feudalism reduced the military power of kings relative to Muslim states, where Mameluch soldiers were recruited and trained to be personally loyal to the king.

follows from an inspection of (EC^H) and (EC^V) that the horizontal constraint is binding if,

and only if $k > \frac{(1+p\psi)C(e)}{p\lambda \left[\frac{C(e)}{q} \right]} \equiv \underline{k}$. These results are summarized by the following

Proposition 7: assume the parties are moderately patient (intermediate values of r), so that the first best cannot be achieved. Then, tighter constraints on the Executive (higher p) increase the equilibrium effort e^c , whereas lower judicial formalism (larger q) increases the effort if, and only if $k > \underline{k}$.

Since \underline{k} increases in ψ , Proposition 7 implies that a reduction in judicial formalism is unproductive whenever the technology favors punishment and expropriation, so that (EC^H) is non-binding.

Intuitively, constraints on the Executive (lower values of p) make it harder for the ruler to use coercive power against the law. This reduces both the ruler's temptation to shirk on punishments and his temptation to expropriate. By increasing the probability that contract breach is punished, a reduction in judicial formalism (higher values of q) reduces the punishment level necessary to deter breach, and hence the ruler's temptation not to punish. However, a reduction in judicial formalism *does not* affect the ruler's incentives to expropriate. This implies that, consistent with the evidence in Acemoglu and Johnson (2005), the economic effect of judicial formalism is of *second order* relative to the effect of constraints on the executive, in the sense that the set of parameters where judicial formalism increases the social surplus is smaller.

While Proposition 7 is consistent with the evidence in Acemoglu and Johnson (2005), it also offers a specific explanation for it, which can be tested empirically. In particular, Proposition 7 implies that, in a cross-country regression of economic development over constraints on the Executive and judicial formalism, formalism should positively interact with the effectiveness of coercion, measured by the punishment cost k and the inverse of the expropriation probability ψ . We hope to bring this proposition to the data in future work.

5.2. The optimal sequencing of institutional reforms

Given the existing empirical evidence on the causal effect of institutions on economic development (see Acemoglu et al. 2005 for a review), a fundamental question for policy-makers is: what is the optimal sequence of institutional reforms? In particular, should efforts be focused on strengthening the constraints on the power of the Executive (e.g. checks and balances), on improving judicial institutions, or both? Proposition 3 provides a natural framework for the optimal sequencing of reforms, in the spirit of the ‘growth diagnostics’ discussed by Hausmann-Rodrik-Velasco (2008):

- Identify first whether the binding self-enforcement constraint is (EC^H) or (EC^V) ;
- Adopt institutional reforms that relax the binding constraint;
- As soon as the other constraint starts to bind, switch to reforms that relax the new binding constraint.

The history of recent development and institutional changes in China indicates that this indeed might have been the development strategy followed by Chinese leaders. Federalism, local elections, and linking a leader's promotion in the ranks of the Chinese Communist Party to the performance of the region administered by that leader have *de facto* relaxed the EC^V constraint, by credibly increasing the cost of expropriation for the political elites and thus making the expropriation technology less effective (Montinola et al. 1995; Xu 2011; Martinez-Bravo et al. 2012). This led to an unprecedented growth in Chinese economy over the last three decades. Xu (2011) argues that during the 1980s and 1990s the binding constraint, in fact, was the vertical one, and that the institutional incentives put in place by the federalist reform easily trumped the imperfections in the legal system.

Nowadays, however, there is mounting evidence that the binding constraint has become the horizontal one, in particular, with regards to the legal institutions governing land use (see, e.g. Peerenboom 2002). Our framework thus underlines the urgent need to switch the focus of institution-building in China on enhancing its legal institutions, without which the future economic growth might turn out to be slower than expected.

5.3. The enforcement of customary law

Propositions 3 and 4 suggest that, since centralized and decentralized States enforce contracts and property rights via coercive punishments, both State forms become more effective as the cost of imposing punishments (the parameter k) decreases. While we assume in the model that the punishment technology is fixed across State forms, a straightforward implication of our analysis is that, if punishment costs were smaller under

one State form due to exogenous reasons, then that State form would be efficient, all else equal.

This prediction is consistent with the enforcement methods commonly used in traditional societies. Many of these societies are part of organized States, where the rulings of formal courts are backed by the State's coercive power (Aldashev *et al.* 2011). Nevertheless, disputes over contracts and property rights between members of a local community are normally resolved by customary judges, whose rulings are not backed by the State but, rather, by a threat of punishment (physical or psychological) and, at the extreme, by violent ostracism imposed by the community members. For instance, thieves may be subject to revenge by the theft's victim and his family, and community members may be allowed and even requested to physically or psychologically harm them (Terris and Inoue-Terris 2002; Aldashev *et al.* 2011).

An explanation for why coercive punishments are imposed by community members (as in our model's decentralized State) is that in a closely-knit traditional society, the punishment inflicted on the felon by community members whom he knows closely can be perceived as more harmful, *ceteris paribus*. This is particularly true for the psychological cost (beyond the physical one) associated with shaming and ostracism. In fact, legal anthropologists (Hoebel 1954; Nader 1969) consider shaming as one of the most effective sanctions in traditional legal systems. Crane (1951) writes: "The big stick which is relied on in this control system [is] not physical punishment, but social attacks upon the extremely vulnerable egos of the members of the group" (cited in Gibbs 1969: 180). Moreover, such punishments are less costly to inflict. In terms of our model, this would

imply that the punishment cost k is lower and the technology of punishment $\lambda(\cdot)$ is more productive when punishments are decentralized to community members than when they are imposed by the State.

5.4. The evolution from private to State enforcement

Proposition 5 suggests that the optimal enforcement system will move from private ordering to some form of State as the punishment cost k decreases. This seems consistent with the historical evidence. On one hand, from the medieval stirrup to the introduction of firearms and remotely controlled weapons (Kontler 2006; Blaydes and Chaney 2012; Onorato *et al.* 2012), there have been steady improvements in the ability of States to use coercion. On the other hand, there has been a parallel historical evolution in enforcement methods from the medieval Law Merchant, where violations of commercial contracts were punished by coordinated traders' boycotts, to modern State enforcement, where judicial rulings on contractual disputes are backed by the State's coercive power (Milgrom *et al.* 1990; Masten and Prüfer 2011). According to our model, the historical improvements in military technology should have decreased the cost of imposing coercive punishments, thus favoring enforcement of contracts by the State over non-coercive enforcement systems like the Law Merchant.

6. Conclusion

This paper has studied coercive enforcement of contracts and property rights by the State as an alternative to private ordering. We have shown that, since using power to punish violations is costly, while using it to expropriate is tempting, the State must constitute a self-enforcing agreement over the use of force. This implies that a State is more likely to succeed when the coercion technology used for punishment is sufficiently productive.

We have applied the model to compare modern States, where coercive enforcement is centralized, to feudal States and traditional societies governed by customary law, where coercive enforcement is decentralized to powerful citizens. We have also used the model to show that institutions that directly constrain the ruler's control of coercion affect State performance more than judicial institutions.

Our results are consistent with recent evidence on the comparative performance of political and judicial institutions (Acemoglu and Johnson 2005), and with the historical evolution from private enforcement systems to the State. We hope to further test the model's predictions in future empirical work on this topic.

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Figure 1. Private ordering: an improvement in the expropriation technology makes the enforcement constraint tighter

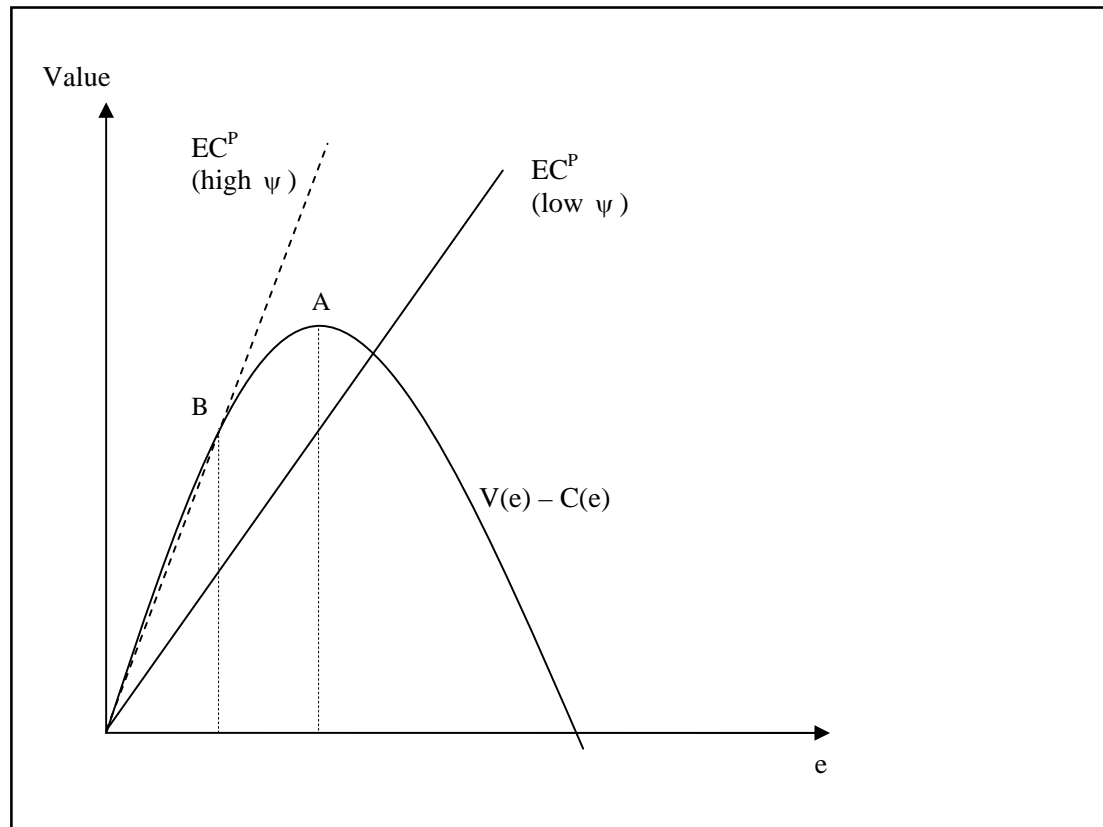


Figure 2. Centralized State: a large increase in the punishment cost switches the binding constraint from EC^V to EC^H

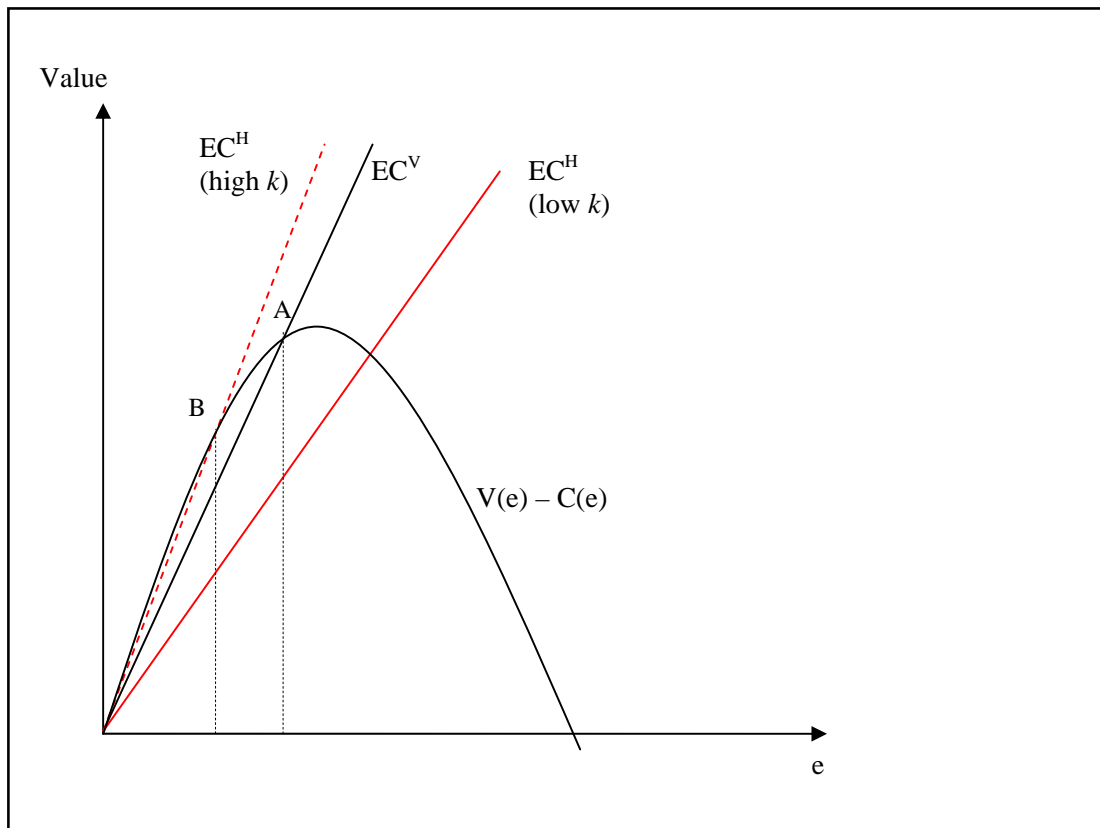


Figure 3. Decentralized State: an increase in the punishment cost makes the enforcement constraint tighter

