Journal of Development Economics 128 (2017) 49–64

Contents lists available at ScienceDirect

Journal of Development Economics

journal homepage: www.elsevier.com/locate/jdeveco

Endogenous enforcement institutions

Gani Aldashev[a,*], Giorgio Zanarone[b]

[a] ECARES, Université libre de Bruxelles (ULB), and CRED, University of Namur, 42 Avenue Roosevelt, 1050 Brussels, Belgium
[b] Colegio Universitario de Estudios Financieros (CUNEF), Calle Leonardo Prieto Castro 2, 28040 Madrid, Spain

ARTICLE INFO

JEL codes:
H11
K42
P48

Keywords:
Coercive power
Expropriation
Enforcement
State

ABSTRACT

Faster courts favor economic development in States with sufficiently constrained executive power, whereas they harm development in States where political power is relatively unconstrained. We document this novel pattern across developing countries, and build a simple model of the State as a self-enforcing social contract, which illustrates how power, and institutions that constrain or complement it, affect development. We show a tradeoff between the two facets of power—enforcement and expropriation. As the ruler's power grows, his temptation to shirk on enforcement diminishes while the temptation to expropriate grows. Consequently, private enforcement optimally evolves into State enforcement. Moreover, faster courts relax the ruler's incentive constraint on enforcement but tighten his non-expropriation incentive constraint; thus, the effect on development depends on which incentive constraint binds in equilibrium. Our results are consistent with the observed cross-country patterns and with historical evidence on transition from the "Law Merchant" enforcement system to the State.

1. Introduction

In the debate concerning the impact of institutions on economic development, two points of view have recently gained prominence. The first, based on the ideas of North (1981), Engerman and Sokoloff (1997), and Acemoglu et al. (2001), stresses the role of political institutions in constraining the power of ruling elites and enforcing property rights. The second, developed by Glaeser and Shleifer (2002), Djankov et al. (2003b), and La Porta et al. (2008), focuses instead on the importance of legal institutions (in particular, legal procedural complexity) in guaranteeing the enforcement of contracts.

The relative importance of constraints on expropriation power and legal institutions for development was investigated empirically by Acemoglu and Johnson (2005), using a cross-section of former European colonies. On one hand, they find that former colonies that inherited secure property rights from their colonizers developed faster. On the other hand, they find that holding the security of property rights constant, colonies that inherited more flexible and procedurally faster court systems (i.e., "better" legal institutions) did not achieve significantly greater development than those with more formalistic legal systems.

A closer look at their data, however, reveals a more nuanced pattern. Table 1 reports the results of instrumental-variable regressions with GDP per capita and foreign direct investment (FDI) attractiveness as measures of economic development,[1] and the two institutional quality measures used by Acemoglu and Johnson (2005)—constraints on the executive and procedural complexity of courts—as explanatory variables. To identify the causal effect of institutions, we build on the empirical strategy developed by Acemoglu and Johnson (2005)—that is, using British legal origin as an instrument for the contemporary complexity of court procedures, and population density in the colonized country in 1500s as an instrument for contemporary constraints on the executive. Columns 1 and 2, displaying the separate effects of these two types of institutions on development, represent the findings of Acemoglu and Johnson (2005). Columns 3 and 4 show that the small and insignificant average effect of legal procedural complexity on the level of economic development hides an important heterogeneity: in fact, the *interaction* between the two types of institutions is negatively and significantly correlated with development. In other words, higher procedural complexity (i.e., "worse" legal institutions) is associated with lower levels of economic development when constraints on the executive are strong, but with higher levels of economic development when those constraints are weak. Columns 5 and 6 indicate that this finding is robust to the inclusion of standard cultural and geographic controls (main religion measures and indicator variable for being landlocked).

These heterogeneous effects of institutions are apparent on Fig. 1, which shows the marginal effect of higher procedural complexity on

* Corresponding author.
E-mail addresses: gani.aldashev@ulb.ac.be (G. Aldashev), gzanarone@cunef.edu (G. Zanarone).

[1] See Appendix A for the construction of this measure and a brief discussion of the sample, of the controls used in our regressions, the descriptive statistics for the main variables, categorization of the countries in the sample by procedural complexity and levels of constraints on the executive, and the results of OLS regressions.

http://dx.doi.org/10.1016/j.jdeveco.2017.05.002
Received 28 October 2015; Received in revised form 27 March 2017; Accepted 7 May 2017
Available online 19 May 2017

Table 1
Causal effect of non-expropriation and enforcement institutions on FDI attractiveness and income per capita.

	(1)	(2)	(3)	(4)	(5)	(6)
	FDI attractiveness, mean 1991–2005	Log GDP per capita, 2003	FDI attractiveness, mean 1991–2005	Log GDP per capita, 2003	FDI attractiveness, mean 1991–2005	Log GDP per capita, 2003
Constraints on executive (avg. for 1990s)	1.043(0.377)***	1.064(0.288)***	4.984(2.270)**	4.888(2.066)**	5.645(2.422)**	4.542(2.363)*
Legal institutions: Procedural complexity	0.359(0.289)	0.183(0.216)	4.204(2.239)*	3.896(1.944)**	4.102(1.637)**	2.365(1.405)*
Interaction term			-0.809(0.433)*	-0.787(0.380)**	-0.929(0.418)**	-0.756(0.419)*
Catholics as % of population in 1980					0.006(0.032)	0.043(0.026)
Muslims as % of population in 1980					-0.017(0.013)	0.003(0.010)
Protestants as % of population in 1980					-0.090(0.053)*	-0.087(0.052)*
Dummy for landlocked country					0.562(0.832)	-0.560(0.551)
Constant	-7.392(2.779)***	1.048(2.129)	-26.272(11.917)**	-17.155(10.651)	-24.540(9.934)**	-8.115(8.139)
Observations	66	68	66	68	66	68
Instrumental variables	UK legal origin; Log population density in 1500	UK legal origin; Log population density in 1500	UK legal origin; Log population density in 1500; interaction between them	UK legal origin; Log population density in 1500; interaction between them	UK legal origin; Log population density in 1500; interaction between them	UK legal origin; Log population density in 1500; interaction between them

Notes: Robust standard errors in parentheses;. The construction of FDI attractiveness (mean 1991–2005) is explained in Appendix 1. Constraints on the executive (average for 1990s) is measured on 1-to-7 scale, with higher values corresponding to stronger constraints. Index of legal procedural complexity is measures on the 10-point scale, with higher values corresponding to higher legal procedural complexity. Results from OLS regressions are reported in Appendix 1 (Table A2).

* significant at 10% level.
** significant at 5% level.
*** significant at 1% level.

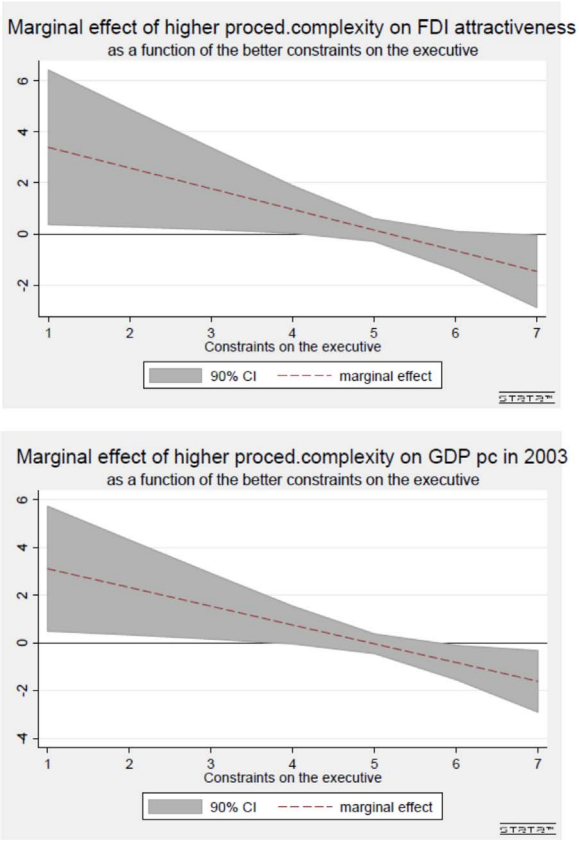

Fig. 1. Heterogeneous effects of legal institutions. *Notes*: The figure shows the marginal effect of higher procedural complexity on the FDI attractiveness and log GDP per capita, for different levels of constraints on the executive, estimated using the model with instrumental variables whose results are reported in columns 3 and 4 of Table 1.

FDI attractiveness and (log) GDP per capita, for different levels of constraints on the executive. Among countries with relatively weak constraints on the executive, those with more complex court procedures seem to perform comparatively better. Contrarily, among countries with relatively strong constraints on the executive, those with more complex court procedures stand at lower levels of economic development.

How important are these heterogeneous effects quantitatively? Our estimates suggest that they are quite large. Consider a country with relatively weak constraints on the executive, e.g. Vietnam (with constraints on the executive at level 3, on the scale from 1 to 7). The complexity of legal enforcement institutions in this country, as measured by the index of procedural complexity, is 4.6 (on 10-point scale). Our IV estimates suggest that *increasing* the procedural complexity of Vietnam by 1 point, from 4.6 to 5.6 would *increase* its GDP per capita from its 2003 level of 471 USD to 2176 USD, the level roughly corresponding to that of Peru.[2] Consider instead a country with strong constraints on the executive (equal to 7), e.g. Uruguay. The complexity of legal enforcement institutions in this country, as measured by the index of procedural complexity, is 5.5. Our IV estimates suggest that increasing the procedural complexity of Uruguay by 1 point, from 5.5 to 6.5 would *decrease* its GDP per capita from its 2003 level of 5315 USD to 1071 USD, the level roughly corresponding to that of the Philippines.[3]

What are the economic forces driving these patterns? *Why* does the effect of legal institutions on development depend on how the political power of ruling elites is constrained? In this paper we develop a simple model of the costs and benefits of State power, which addresses these questions and, more broadly, illustrates how power, and the institutions that constrain it or complement it, may affect long-term economic development.

In our model, two powerless agents and a powerful ruler interact repeatedly. Agent 2 (a buyer, an employer) acquires a good or a service from agent 1 (a seller, an employee) in exchange for compensation. Given that this is a non-spot exchange, agent 1 performs only if he expects agent 2 to pay him the promised compensation (i.e. contracts have to be enforced), and the ruler not to expropriate it (i.e. property rights have to be protected). In the absence of well-functioning commitment mechanisms guaranteeing this, neither expectation is fulfilled, and the resulting equilibrium is characterized by low social surplus.

Since the parties interact repeatedly, better outcomes may be achieved by conditioning future cooperation on the agents' and the ruler's present behavior. In particular, agent 2 may prefer to pay agent 1 today (i.e. honor the contract) and receive higher surplus in the future from agent 1's performance, and the ruler may prefer not to expropriate agents 1 and 2 today (i.e. respect the property rights) and collect part of the surplus through steady tax revenues in the future. We call this solution "private ordering" because the value of future voluntary cooperation between productive agents and the ruler directly guarantees the enforcement of both contracts and property rights.

Alternatively, a "State" may be created where *the ruler takes up the role of contract enforcer*. In a State, if agent 2 fails to pay agent 1, the ruler may confiscate the agent 2's property and, in addition, may inflict on him a costly coercive punishment (for instance, imprisonment). Since the ruler himself cannot be punished coercively, his repeated interaction with the agents is used to prevent expropriation, as in private ordering. In addition, the repeated interaction is also used to provide the ruler with an incentive to inflict costly punishments whenever called upon. If inflicting a given punishment is not too costly for the ruler, so that minimum necessary punishments (upon contractual breach) need not be too tough, then the threat of State enforcement is credible.

The key implication of our model is that there is a tradeoff between the two dimensions of coercive power—contractual enforcement and expropriation. When his power is constrained politically, the ruler is not tempted to expropriate; however, because inflicting coercive punishments is costly, he is tempted to shirk on enforcement. This has two consequences: (i) it might be optimal not to delegate enforcement to the ruler—that is, the private ordering arrangement dominates State enforcement; (ii) when it is still optimal to delegate enforcement to the ruler, faster legal procedures – which relax the ruler's (binding) incentive constraint on enforcement – enhance economic performance.

As the ruler's power grows, his temptation not to enforce diminishes while the temptation to expropriate grows, so State enforcement becomes more attractive than private ordering. At high enough levels of power, the ruler's binding incentive constraint is that on expropriation, whereas the incentive constraint on enforcement becomes slack. As a result, faster legal procedures, which increase the ruler's ability to use coercive power and hence relax his (non-binding) incentive constraint on enforcement, no longer raise social surplus. On the contrary, such improvements can lower surplus by making expropriation easier and thus undermining the ruler's commitment

[2] Based on the estimates from column 4 of Table 1, for a country with the level of constraints on the executive equal to 3, a 1-point increase in legal procedural complexity would raise the log of GDP per capita in 2003 by 3.896–0.787*3 = 1.535. Log of GDP per capita of Vietnam would increase from 6.15 to 7.685, which implies the new level of GDP per capita equal to 2176.

[3] Based on the estimates from column 4 of Table 1, for a country with the level of constraints on the executive equal to 7, a 1-point increase in legal procedural complexity would raise the log of GDP per capita in 2003 by 3.896–0.787*7 = - 1.613. Log of GDP per capita of Uruguay would decrease from 8.59 to 6.977, which implies the new level of GDP per capita equal to 1071.

not to expropriate.

The above result provides a theoretical explanation for the empirical patterns in Table 1. Lower procedural complexity, which reduces the costs of contract enforcement by the State but also the administrative hurdles for expropriation, favor economic development only if State power is sufficiently politically constrained (and hence the ruler's temptation to shirk on enforcement is binding). Contrarily, lower procedural complexity in settings where State political power is relatively unconstrained is harmful for development, because it increases the ruler's temptation to expropriate. More broadly, our model implies that the effects of political and legal institutions on development interact, and hence should not be analyzed in isolation, and that pro-development reforms should focus on relaxing the binding institutional constraint on State power. Reforms that focus on the non-binding constraint—for instance, by improving courts when State power is too strong, or constraining the ruler's discretion when State power is already weak—will have no (or negative) effect on development.

By showing that the State should not enforce contracts when the ruler's cost of enforcement is relatively high, our model also provides a theory of the choice between private and public enforcement systems. This theory can explain why, in the Middle Age, State enforcement applied only to local disputes, where both parties were subject to the same ruler, while the Law Merchant private enforcement system applied to disputes between merchants, who often belonged to different jurisdictions within a feudal State, and hence could not be easily coerced by the king. Our result also explains why, in parallel with reductions in the cost of coercion and the consequent switch from feudal to centralized States (Tilly, 1990; Gennaioli and Voth, 2015), the Law Merchant was gradually replaced by court-enforcement systems backed by the State's coercive power (Milgrom et al., 1990; Cutler, 2003; Masten and Prufer, 2014).

1.1. Related literature

This paper relates to a broad literature in political economy, which studies how the State can credibly commit not to use violence in order to expropriate citizens. In particular, Greif et al. (1994) show how repeated interactions between rulers and traders can generate commitment. Olson (1993) and Acemoglu (2003) emphasize how a ruler's monopoly on coercion limits his ability to commit. Elaborating on these contributions, more recent works study how institutions such as open access to markets and federalism (Weingast 1995; De Figueiredo and Weingast, 2005; North et al., 2009), democratic budgetary control (Besley and Persson, 2011a, 2011b), and democratic elections (Fearon, 2011), may soften the ruler's commitment problem. Evidence consistent with this mediating role of political institutions has been provided, among others, by Acemoglu et al. (2001, 2002, 2005), Acemoglu and Johnson (2005), and Dincecco et al. (2011).

Our paper contributes to the above literature by jointly analyzing the ruler's commitment not to expropriate and his commitment to enforce contracts as consequences of his monopoly on coercion, and by showing that the two commitment problems interact. Our results, which are consistent with the observed facts from former colonies, reconcile the works stressing the documented pro-development effect of legal and judicial institutions (e.g., Djankov et al., 2002, 2003b; Auer, 2013) with those stressing the importance of constraints on the expropriation capacity of rulers and the elites (e.g., Acemoglu et al., 2001, 2002; Acemoglu and Johnson, 2005).

Our paper also relates to the literature on "private ordering", which 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". For instance, Ostrom (1990) and Ellickson (1991) study how communities can, respectively, preserve public good provision from free-riding, and protect property rights, in the absence of State intervention. Milgrom et al. (1990), Dixit (2003a, 2003b), and, more recently, Hadfield and Weingast (2012a, 2012b), Masten and Prufer (2014), and Levine and Modica (2016) analyze private enforcement systems for commercial transactions. Bernstein (1992) and Williamson (1991) discuss how parties involved in economic exchanges may "opt out" of the State's legal system, either contractually or by integrating their activities into a unified firm.[4] These literatures are reviewed by Dixit (2004) and Greif (2006).

An implicit assumption in most of the literature on private ordering is that enforcement by the State is preferable whenever breach can be verified by courts, so the choice between private and State enforcement is largely driven by information costs. Our paper innovates on this literature by showing that a tradeoff between State enforcement and private enforcement exists even in the absence of verifiability problems, and that an important driver of the choice between the two enforcement systems, ignored by almost all the existing studies[5], is the ruler's cost of credibly committing to enforce, which is affected by the coercion technology.[6]

The rest of the paper is organized as follows. Section 2 presents the setup of the model. Section 3 analyzes private ordering. Section 4 analyzes the State. Section 5 presents our results on how power and the ruler's enforcement technology affect welfare and development, and discusses some applications. Section 6 concludes.

2. The model

2.1. Setup

There are two agents, specialized in production, and a cash-constrained ruler, specialized in coercion, who have the opportunity to interact at dates $k = 0,1,2, \ldots$. All parties in the model are risk-neutral and discount next-period incomes at the common factor $\delta \in [0,1]$. We may interpret the two agents as an employee and an employer, or as a seller and a buyer. More generally, this model applies to many settings in which there exist productive opportunities involving non-spot exchange in the shadow of a third party's coercive power.

At the beginning of any given time k, the ruler offers to the two agents a contract, which consists of a non-negative transfer, $t_{ik} \in \mathbb{R}^+$, that agent $i \in \{1,2\}$ is supposed to pay upfront to the ruler, a productive action, $a_k \in \{0,1\}$, that agent 1 is supposed to take, a bonus, $b_k(a_k): \{0,1\} \rightarrow \mathbb{R}$, that agent 2 is supposed to pay to agent 1 conditional on agent 1's action, a share $\gamma_k \in [0,1]$ of the output (to be defined in a moment) that agent 2 should give to the ruler, and coercive actions (to be also defined in a moment) that the ruler is supposed to take.

Agent i may accept or reject the ruler's offer. Let the agent's decision be $e_{ik} \in \{0,1\}$, where $e_{ik} = 1$ denotes acceptance. In the event of acceptance, agent i enters the ruler's territory and pays his upfront transfer, t_{ik}, to the ruler.

Since the ruler is cash-constrained and hence cannot directly acquire agent 1's output, production can only take place if both agents are available. Thus, if either agent rejects the ruler's offer ($e_{ik} = 0$ for some i), all parties

[4] There is also a broad theoretical literature on relational, or informal, contracts, which studies how self-enforcing agreements, alone or in combination with court-enforced agreements, can be used to contract over actions that are non-verifiable by courts. See MacLeod (2007) and Malcomson (2013) for comprehensive reviews.

[5] One exception is Gibbons and Rutten (2007), which, however, does not study the role of the coercion technology. In a paper subsequent to ours, Acemoglu and Wolitzky (2015) develop a model of specialized enforcement and compare it to community enforcement. However, they abstract away from the problems of expropriation by the specialized enforcers, and the interaction between enforcement and expropriation, which we focus on.

[6] While under-formalized, the problem of making costly enforcement credible ("guarding the guardians") has been discussed in the economics literature (see Dixit (2004) and Hurwicz (2008) for a review). More recent models focus on how to design contracts that motivate supervisors to spend monitoring effort (e.g., Rahman, 2012; Mookherjee, 2013). Our paper brings these ideas into a model where the choice of using costly enforcement is endogenous.

receive a payoff of zero and the game moves to period $k+1$. If instead both agents accept ($e_{1k}=e_{2k}=1$), agent 1 chooses the productive action, a_k. Agent 1's action generates output $V(a_k)\equiv a_k V$, which accrues to agent 2, but also a cost $C(a_k)\equiv a_k C$ for agent 1. Accordingly, the total surplus from production is given by $s(a_k)\equiv V(a_k)-C(a_k)=a_k(V-C)$. We assume $V>C$, that is, surplus is maximized if production takes place in every period. After receiving the output, agent 2 chooses whether to pay the bonus, $b_k(a_k)$, to agent 1, and subsequently, whether to give the output share, $\gamma_k V(a_k)$, to the ruler.

The ruler has a monopoly on coercive power, which he can use against the two agents after the production and payment decisions are made. Specifically, the ruler may use power either for expropriation or for enforcement—that is, to punish deviations by the two agents. Let $x_k^b\in\{0,1\}$ and $x_k^y\in\{0,1\}$ be the ruler's decision, respectively, to expropriate the bonus, $b_k(a_k)$, from agent 1, and the output, $V(a_k)$, from agent 2, and let $L_{ik}\in\mathbb{R}^+$ be the punishment inflicted by the ruler to agent i. If the agent receives punishment L_{ik}, he suffers disutility L_{ik} while the ruler incurs a punishment cost $\lambda(L_{ik})$, where $\lambda(0)=0$ and $\lambda'(\bullet)>0$.[7]

Importantly, we assume the ruler's power is subject to exogenous constraints of two types. The first are *judicial/procedural constraints* that apply regardless of whether power is used for enforcement or expropriation (as in Djankov et al. (2003a); see discussion at the end of this section). The second are *political constraints* that apply only if power is used for expropriation (in this, we are similar to the definition of *de jure* political power in Acemoglu and Robinson (2008)). We index the procedural constraints with the parameter $q\in[0,1]$, and political constraints with the parameter $\psi\in[0,1]$, such that if the ruler attempts to punish an agent, he succeeds with probability q (and fails with probability $1-q$), whereas if the ruler tries to expropriate an agent, he succeeds with probability ψq (and fails with probability $1-\psi q$).

These two parameters play an important role in the model, in particular, for delivering its main comparative statics results. A key interpretation of these parameters, consistent with the empirical facts documented in the introduction and in Acemoglu and Johnson (2005), is in terms of exogenously given institutions that determine how the ruler can use his coercive power. In proposing this interpretation of ψ and q, we rely on the idea that, for many countries in the world, both legal (procedural-complexity) institutions (Glaeser and Shleifer, 2002; La Porta et al., 2008) and political institutions that constrain the executive (Acemoglu et al., 2001, 2002) are inherited from ex-colonizing power or by historical accident, and therefore, can be taken – at least in the medium run – as exogenous.

At the end of the period, each agent chooses whether to stay in the ruler's territory or exit, after which the game moves to period $k+1$. The within-period sequence of events is illustrated by Fig. 2 below.

Given the above definitions, the per-period expected payoffs of the ruler, agent 1, and agent 2, evaluated at the beginning of period k, are, respectively:

$$\pi_k \equiv (1-\delta)\sum_{\tau=k}^{\infty}\delta^{\tau-k}\left\{\sum_{i=1}^{2} e_{ik}[t_{ik}-q\lambda(L_{ik})] + e_{1k}e_{2k}[(\gamma_k+x_k^y\psi q(1-\gamma_k))V(a_k)+x_k^b\psi q b_k(a_k)]\right\},$$

$$u_{1k} \equiv (1-\delta)\sum_{\tau=k}^{\infty}\delta^{\tau-k}\{e_{1k}e_{2k}[(1-x_k^b\psi q)b_k(a_k)-C(a_k)] - e_{1k}[t_{1k}+qL_{1k}]\},$$

$$u_{2k} \equiv (1-\delta)\sum_{\tau=k}^{\infty}\delta^{\tau-k}\{e_{1k}e_{2k}[(1-\gamma_k)(1-x_k^y\psi q)V(a_k)-b_k(a_k)] - e_{2k}[t_{2k}+qL_{2k}]\}.$$

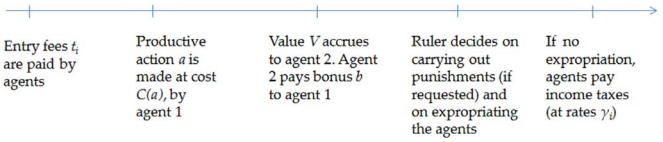

Fig. 2. Within-period timing.

We maintain the following additional assumptions throughout the model.

Assumption 1. In any given period, the two agents and the ruler observe all the relevant information—that is, the participation decisions, the productive action, the payments, and the coercion decisions.

Assumption 2. The ruler cannot make positive monetary transfers to agent 1 or agent 2 at any point in time.

Assumption 1—that is, perfect public monitoring—is standard in repeated game models of contracting (e.g., MacLeod and Malcomson, 1989). Assumption 2 formalizes the ruler's cash constraint: it restricts the upfront transfers to be non-negative ($t_{1k}\geq 0$ and $t_{2k}\geq 0$), and it also rules out the possibility that the ruler may pay the contingent bonus, $b_k(a_k)$, to agent 1.[8] This second assumption is key to our model's purpose—studying the double-edged effect of power, as a threat and as a garantor of order, on productive exchanges. If the ruler could directly buy agent 1's services, thereby becoming his "employer", power would no longer pose an expropriation threat, and the two-sided effect would disappear. We will return on this point in Section 3.

2.1.1. Discussion

Our assumption of a double-edged judicial/procedural constraint (parameter q), which limits the ruler's power both when it is used for enforcement and when it is used for expropriation, is consistent with the theoretical analysis in Djankov et al. (2003a). They argue that when designing their institutions, societies face a tradeoff between "the costs of disorder and those of dictatorship". This tradeoff arises because a government that is given enough power to protect citizens from expropriation may at some point use such power to become itself an expropriator. Consider in this light the choice to create an independent judiciary that applies formal rules and procedures to check whether actions taken by the members of society (including the ruler) comply with the law (in terms of our model, this scenario would correspond to a large value of the q parameter). These legal formal procedures will limit the State's ability to have the judiciary rubber-stamp expropriation decisions, such as collection of undue tax payments, or the taking of privately owned assets in the absence of public utility reasons. At the same time, formal procedures may also slow down judicial rulings against contractual breach and property violations by private citizens, and consequently the imposition of appropriate sanctions and remedies by the State.

It is important to notice that while we assume here, in the interest of notational simplicity, that procedural constraints equally limit the ruler's ability to enforce and to expropriate, our comparative static results do not depend on this assumption. All is needed for those results—particularly, for the prediction that procedural constraints increase output when political constraints are weak, and decrease it when political constraints are strong—is that the procedural constraints be double-edged—that is, that they affect not only enforcement, but also expropriation. We return on this point, and discuss possible extensions of our model, in the conclusion.

[7] We assume, for simplicity, that expropriation is costless for the ruler, up to the political constraints explained below. The results do not change if this assumption is relaxed, so long as the cost of expropriation is sufficiently low so as for the ruler still to have some temptation to expropriate.

[8] In other words, even if the ruler receives positive upfront transfers from the agents, he cannot use them to pay the bonus. For instance, the ruler may be indebted, or committed to provide unmodeled public services, and hence he may have to immediately consume the upfront transfers.

2.2. Social contracts

A *social contract* is a complete plan for the relationship between the two agents and the ruler. Let $\boldsymbol{h}^k$ be the history of play up to time k, and H^k the set of possible time k histories. Then, for each time k and history $\boldsymbol{h}^k \in H^k$, a social contract describes: (i) the contract the ruler should offer the agents (and that should be honored); (ii) whether the agents should accept or reject the ruler's offer; in the event of acceptance by the two agents, (iii) the productive action that agent 1 should take; (iv) the level of harm that the ruler should exert against the two agents; and (v) whether the ruler should attempt to expropriate the agents or not.

We say that such social contract is *self-enforcing* if it describes a subgame perfect equilibrium of the repeated game—that is, if all parties' actions following each history, both on and off the equilibrium path, constitute a Nash equilibrium.

While there may be many self-enforcing social contracts, we focus on optimal stationary contracts—that is, self-enforcing social contracts where the players' equilibrium behavior is the same in every period and that give the ruler a higher payoff than any other self-enforcing stationary contract. Maximizing the ruler's payoff is consistent with the fact that the ruler has a monopoly over coercive power, and hence greater bargaining power than the two agents, when deciding on the social contract setup. In turn, since an optimal social contract maximizes the utility of the cash-constrained party (that is, the ruler), restricting attention to stationary contracts is without loss of generality (see, e.g., Thomas and Worrall (1994)).[9] Accordingly, we hereafter drop the time subscript k from all equilibrium variables in the model.

We also restrict attention to social contracts where there is no coercion in equilibrium: $x^b = x^v = L_i = 0$ for all i. Assuming no coercion in equilibrium is without loss of generality for two reasons. First, any redistribution of surplus from the agents to the ruler that is achieved through expropriation ($x^b = 1$ or $x^v = 1$) can also be achieved by increasing the upfront transfer, t_1 and t_2, or the ruler's output share, γ. Second, since harming the agents ($L_i > 0$ for some i) reduces surplus and is costly to the ruler, it cannot occur in equilibrium in an optimal social contract.

Our primary concern in the rest of the paper is to study optimal *enforcement institutions*—that is, how deviations from a social contract should be punished so that the surplus (and thus the ruler's payoff) is maximized. We proceed in three steps. First, we study social contracts that are optimal within the class of contracts that do not require costly coercive punishments by the ruler off the equilibrium path, following a deviation. We call this class of social contracts *private ordering*.

Definition 1. A self-enforcing social contract is called private ordering if in the event of a deviation from equilibrium behavior at any time d, the contract prescribes no costly coercion by the ruler: $L_h = 0$ for all $h \geq d$.

Next, we study social contracts that are optimal within the class of social contracts that do require costly coercive punishments by the ruler following a deviation by one of the two agents. We call a social contract in this class a *State*.

Definition 2. A self-enforcing social contract is called State if for some agent i and times d and $h \geq d$, and following a deviation from equilibrium behavior by agent i at time d, the contract prescribes costly coercion by the ruler: $L_{ih} > 0$.

As a final step, we compare the optimal social contracts in the private ordering and state categories, and we analyze under what conditions the overall optimal social contract belongs to one category or the other.

3. Enforcement institutions

We begin by defining simple stationary social contracts for both private ordering and the state. We then characterize optimal stationary contracts. All proofs are in Appendix B.

Definition 3. A social contract is stationary if on the equilibrium path, agent 1's productive action, the upfront transfers and output shares paid by the two agents to the ruler, and the bonus paid by agent 2 to agent 1, are the same in every period.

Notice that only two levels of surplus are feasible under stationary social contracts: either agent 1 produces in every period, and the surplus is $V - C$, or agent 1 never produces, and the surplus is zero. Given our assumption that $V > C$, if the social contract where the agent produces in every period is self-enforcing, it is also optimal.

3.1. Non-coercive enforcement: private ordering

Consider a private ordering stationary social contract (hereafter, POSC) with the following properties. (1) Both agents participate: $e_1 = e_2 = 1$. (2) Agent 1 produces: $a = 1$. (3) Agent 2 pays to agent 1 a bonus equal to his production cost: $b(1) = C$. If it is self-enforcing, this POSC generates the maximum level of per period surplus, $s = V - C$, and hence is optimal.

Let $R^P \equiv (1 + \psi q)C$, and define the following condition:

$$R^P \leq \frac{\delta}{1-\delta} s. \qquad (\text{EC}^{\text{P}})$$

Condition (EC^{P}) requires that at any given time, the discounted total surplus from production be larger than the sum of agent 1's cost of producing and the ruler's expected gain from expropriating agent 1's bonus. Accordingly, we refer to R^P as the aggregate *reneging temptation*. It turns out that this simple condition fully characterizes an optimal POSC.

Proposition 1. In an optimal POSC, agent 1 produces in every period ($a = 1$) if condition (EC^{P}) holds, and never produces ($a = 0$) if condition (EC^{P}) does not hold.

Proof: in Appendix B.

Intuitively, if condition (EC^{P}) holds, there is enough continuation surplus in the tri-lateral relationship between the two agents and the ruler for agent 2 to be willing to reward agent 1's production cost, and for the ruler to be willing not to expropriate agent 1's compensation. In contrast, if condition (EC^{P}) does not hold, there are two possibilities, both of which prevent the productive exchange from taking place. One is that there is not enough surplus in the relationship to ensure that agent 1 recovers his production cost through compensation, and as a result, agent 1 has no incentive to produce. Alternatively, the constraints (procedural and political) on the ruler are so weak that, for given value of surplus, his temptation to expropriate is irresistibly high; understanding this, agent 1 abstains from production.

As in all models of relational contracting, incentives and surplus are constrained by the parties' discount rate, δ. For a sufficiently low δ, no productive social contract can be self-enforcing. If δ is sufficiently high, condition (EC^{P}) becomes slack, and a productive social contract is self-enforcing. Our result differs from standard relational contracting models at intermediate levels of δ, for in that case (constraints on) the ruler's coercive power, measured by ψ and q, also constrain surplus. For $\psi q \approx 0$, the expropriation threat is non-binding, and the only issue is to provide agent 2 with sufficient incentives to reward agent 1, as in Levin (2003). As $\psi q \to 1$, condition (EC^{P}) becomes binding, and the

[9] In repeated game models without cash constraints, focusing on stationary contracts is without loss of generality irrespective of the distribution of bargaining power, because any incentives that are created through changes in future equilibrium behavior can be replicated via immediate monetary transfers (MacLeod and Malcomson, 1989; Levin, 2003). In our model with a cash-constrained ruler, if we looked for a social contract that maximizes one of the two agents' utility, the optimal contract would typically be non-stationary, as the ruler's incentives to expropriate in future periods could be reduced, and hence the agent's productive action increased, by backloading the ruler's compensation (see Thomas and Worrall (1994), for the details). As explained above, focusing on contracts that maximize the ruler's utility, and hence are optimally stationary, seems natural in our context.

threat of expropriation by the ruler may destroy the agent's incentives and prevent production. In particular, for any given combination of ψ and q, there exists a critical discount rate, δ^*, increasing in ψq, such that productive exchange becomes unfeasible for $\delta<\delta^*$.

3.2. Coercive enforcement: the State

By our own definition, the State encompasses a set of social contracts where the agents' deviations are punished coercively by the ruler. A simple punishment strategy, which mirrors the impersonal nature of state enforcement in spot market transactions, consists of the ruler immediately punishing the deviating agent and all parties returning to "business as usual" after the punishment occurs.

Definition 4. Under *concentrated coercive punishments*, in the event of a deviation, the ruler inflicts harm L_i to the deviating agent i and expropriates his available income (if any) in the period where the deviation occurs, and then all parties revert to the optimal SSC from the following period and thereafter.

Consider now a state with concentrated coercive punishments where the ruler and the two agents enter a stationary social contract (hereafter, SSC) with the following properties. (1) Both agents participate: $e_1 = e_2 = 1$. (2) Agent 1 produces: $a = 1$. (3) Agent 2 pays to agent 1 a bonus equal to his production cost: $b(1) = C$. (4) If agent 2 deviates by not paying the bonus, the ruler expropriates output ($x^v = 1$) and inflicts harm $L_2 = \frac{1}{q}[C - (\psi q - \gamma)V]$ on the deviating agent in the current period, and all parties return to SSC from the next period and thereafter.

In the above SSC, the costly punishment that the ruler threatens to inflict, so as to deter a deviation by agent 2, is given by the agent's saving from not paying the bonus, C, discounted by the deviating agent's immediate output loss from punitive expropriation, $(\psi q - \gamma)V$, and augmented by the agent's likelihood to escape punishment, $\frac{1}{q}$.[10]

Define:

$$\gamma^* \equiv \begin{cases} \overline{\gamma}\ , \ \ if\ \ \lambda\left(\frac{1}{q}[C - (\psi q - \overline{\gamma})V]\right) < \psi q C + (\psi q - \overline{\gamma})V \\ \underline{\gamma}\ , \ \ if\ \ \lambda\left(\frac{1}{q}[C - (\psi q - \overline{\gamma})V]\right) \geq \psi q C + (\psi q - \overline{\gamma})V \\ 0\ , \ \ if\ \ \lambda\left(\frac{1}{q}[C - \psi q V]\right) > \psi q C + \psi q V. \end{cases}$$

Here, $\overline{\gamma} \equiv 1 - \frac{C}{V}$, whereas $\underline{\gamma}$ is the value of γ such that the ruler's present gain from not punishing a deviation by agent 2 equals his gain from expropriating agent 1's bonus and agent 2's output, and is pinned down by the following equation:

$$\lambda\left(\frac{1}{q}[C - (\psi q - \underline{\gamma})V]\right) = \psi q C + (\psi q - \underline{\gamma})V.$$

Define also:

$$R^H \equiv \lambda\left(\frac{1}{q}[C - (\psi q - \gamma^*)V]\right),$$
$$R^V \equiv \psi q C + (\psi q - \gamma^*)V,$$
$$R^S \equiv max\{R^H, R^V\}.$$

Finally, define the following condition:

$$R^S \leq \frac{\delta}{1-\delta} s. \qquad (EC^S)$$

Condition (EC^S) requires that at any given time, the discounted net surplus from production be larger than the ruler's temptation to shirk on punishing agent 2 following a deviation (R^H) *and* the ruler's temptation to expropriate the two agents (R^V). The ruler's output share, γ^*, is chosen to minimize the ruler's *binding temptation* (see the proof of Proposition 2 in Appendix B for the details).

Proposition 2. In an optimal SSC, agent 1 produces in every period ($a = 1$) if condition (EC^S) holds, and never produces ($a = 0$) if condition (EC^S) does not hold.

Proof: in Appendix B.

In proving Proposition 2 in Appendix B, we proceed in two steps. We begin by proving that a SSC that is optimal among all SSC with concentrated coercive punishments is fully characterized by condition (EC^S) above. When that is the case, agent 1 has an incentive to produce. Next, we prove that assuming concentrated coercive punishments is without loss of generality. The intuition behind our first claim is simple. If condition (EC^S) holds, there is enough continuation surplus in the tri-lateral relationship for the ruler to be simultaneously willing to enforce the contract between agent 1 and agent 2 in case of breach, and not to expropriate the two agents' incomes. Regarding the optimality of concentrated coercive punishments, there are two key points. The first point is that, because coercive punishments are costly and they can only be imposed by the ruler, the ruler must be provided with incentives to punish when prescribed—that is, state enforcement must be itself self-enforcing.[11] Thus, when the ruler is expected to punish the agents' deviations coercively, production cannot cease perpetually following an agent's deviation, as in private ordering, because costly punishments can only be rewarded by providing the ruler with some continuation utility. The second point is that, because the agents are not perpetually "stuck" in the ruler's territory—i.e., they can exit at the end of each period—coercive punishments must be administered right after the deviation rather than being spread across periods.[12]

Notice that our Assumption 1—perfect public monitoring—greatly simplifies the characterization of optimal social contracts. However, the model is robust to the inclusion of some degree of private information. For instance, in a setting where output is stochastic and agent 1 privately observes his own productive action and the state, production could be elicited by conditioning the bonus to output realizations. Payments and non-expropriation, which are publicly observed, would continue to be guaranteed by the threat of punishment, and there would be no need for punishments on the equilibrium path following a low output realization (Levin, 2003).

3.3. Private ordering vs. State

Having derived optimal social contracts under fixed enforcement institutions, we now ask which enforcement institutions (private ordering or the state) are optimal. A key point here is that the aggregate gains from a productive social contract (surplus s in the right-hand side of conditions (EC^P) and (EC^S)) are the same under both private ordering and the state, whereas the temptation to renege on such contract (the left-hand side) differs across enforcement institutions. Therefore, at intermediate levels of the parties' discount rate, it is optimal to choose those enforcement institutions that minimize the reneging temptation.

[10] Notice that even when the ruler expropriates agent 2 to punish a deviation, his expropriation power is subject to the political constraint ψ. This is consistent with the fact that in our model, political (and procedural) constraints are exogenous and pre-exist any social contract the ruler may enter with the two agents. For example, there may be an implicit agreement such that if agent 2 deviates, the ruler may tax his income more (punitive expropriation), but if there is a pre-existing institutional constraint whereby taxation is subject to approval by a parliament where both agents are represented, the ruler may fail, ex post, to secure such approval.

[11] Assuming costly punishments does not rule out that the ruler may receive some private benefit from punishing devious behavior (Ostrom et al., 1992; Kosfeld and Rustagi, 2015), so long as such benefit is outweighed by the cost. This assumption seems appropriate in our context where the ruler is an institutional third party, and it is consistent with recent experimental evidence showing that third-party punishers who are not accountable tend to shirk on punishments (Ottone et al., 2015).

[12] The existence of periodical exit opportunities is consistent with the FDI setting in our data and more broadly, with settings characterized by some mobility of people and capital. Relaxing the free exit assumption may generate some spreading of coercive punishments over time, but would not significantly alter our results. See Acemoglu and Wolitzky (2015) for a model of coercive punishments without free exit.

Proposition 3. Assume $R^P \neq max\{R^H, R^V\}$. Then, there are critical discount rates, $\overline{\delta}$ and $\underline{\delta}$, with $\overline{\delta} > \underline{\delta}$, such that: (i) for $\delta < \underline{\delta}$, surplus is zero under both private ordering and the state; (ii) for $\delta \in [\underline{\delta}, \overline{\delta})$, surplus is s under the enforcement institutions with lower reneging temptation, and zero under the enforcement institutions with higher reneging temptation; and (iii) for $\delta \geq \overline{\delta}$, social surplus is s under both private ordering and the state.

Proof: In Appendix B.

An implication of Proposition 3 is that, since the enforcement technology, $\lambda(\bullet)$, affects the cost of enforcement in the state but not under private ordering, improvements in such technology (i.e., downward shifts in the $\lambda(\bullet)$ function) will favor private ordering over the state, and vice versa. We will return on this point in Section 4, where we discuss the transition from the Law Merchant system to the State enforcement of commercial contracts in medieval Europe.

While analytically simple, the above result is conceptually subtle. Most formal analyses of contractual exchange assume that private, non-coercive enforcement mechanisms must rely on the parties' patience and on the prospect of future interactions (the discount factor δ) to deter non-compliance, whereas public enforcement benefits from the state's commitment to punish violators. That is why economists usually see self-enforcement as the price to pay for using informal and relational contracts and thus escaping output measurement and court verification problems.[13] By endogenizing the state's use of power as part of a social contract, we show that the "shadow of the future" (that is, δ) affects surplus under both private and state enforcement, and that which enforcement institutions are optimal depends on the reneging temptation.

3.4. Constraints on the ruler

Building on the above analysis, we now study how changes in the exogenous constraints on the ruler's power (parameters ψ and q) affect the equilibrium production level in an optimal social contract, both under private ordering and in the State.

Under private ordering, the analysis is straightforward. Since both procedural and political constraints limit the ruler's ability to expropriate, and given that the ruler does not provide enforcement services under this arrangement, tightening the constraints relaxes the condition for self-enforcement, (EC^P), and hence unambiguously facilitates production.

Proposition 4. Suppose private ordering is (weakly) optimal, that is, $R^P < R^S$.[14] Then, production and surplus are non-increasing in constraints on the ruler's power, ψ and q.

Proof: By inspection of R^P.

In the State, the effect of constraints on the ruler on production is a priori less clear-cut. While tightening procedural and political constraints reduces the ruler's temptation to expropriate, R^V, it also increases the ruler's temptation to shirk on enforcement, R^H. A decrease in q or ψ makes coercive punishments less certain, thus forcing the ruler to increase their size in order to deter deviations. This increase in punishment size, in turn, makes the ruler more tempted to shirk on his enforcement duties in the event of a deviation. Thus, whether tightening of constraints on the ruler's power increases or decreases production depends on which of the ruler's two temptations—expropriating or shirking on enforcement—is binding, that is, on whether $R^S = R^H$ or $R^S = R^V$. This, in turn, creates an interaction between procedural and political constraints:

Proposition 5. Suppose the State is (weakly) optimal, that is, $R^P > R^S$. Then, weaker procedural constraints (an increase in q) do not decrease production and surplus (and might increase it) if political constraints are sufficiently strong (small ψ). In contrast, weaker procedural constraints do not increase production and surplus (and might decrease it) if political constraints are sufficiently weak (large ψ).

Proof: In Appendix B.

Intuitively, lower procedural filters on the ruler's use of power may *reduce*, rather than increase, surplus when the ruler is relatively politically unconstrained. This is because in that case, the State's binding credibility problem becomes that of non-expropriation, rather than that of enforcement; if so, lower procedural constraints will only make expropriation easier and thus harm production. This result stands in contrast to the conventional view of lower procedural complexity facilitating development (e.g., Djankov et al., 2003b); however, it is consistent with the idea that the lack of procedures and formalism may have a dark side—namely, facilitating rulers' abuses (e.g., Djankov et al., 2003a; Glaeser and Shleifer, 2002).

4. Applications

4.1. Institutional interaction

Proposition 5 provides a theoretical explanation for the cross-country empirical patterns noted in the introduction, and summarized in Table 1. Low procedural complexity, which reduces the costs of contractual enforcement by the state (but also the costs of transferring property to the state), appears to have favored economic development only in former colonies where the power of the state is sufficiently constrained. In our framework, the rulers in such colonies face sufficient checks and balances on their political power, so that the binding constraint (i.e. the one that determines the economic performance) is that on enforcement ($R^S = R^H$). Then, lowering procedural complexity relaxes this binding constraint (i.e. reduces the ruler's temptation to shirk on enforcement), which improves economic performance. Contrarily, in former colonies with weak or absent political controls on the rulers' power (i.e. large ψ), the binding constraint on economic performance is the one concerning the ruler's temptation to expropriate. In such settings, lowering procedural complexity makes this constraint only tighter (by making expropriation easier, and thus increasing the ruler's temptation to expropriate), and this harms economic performance. In sum, the effect of lower procedural complexity on economic performance is non-linear and crucially depends on the level of constraints on the executive, just as described in Fig. 1.

Our results have also a normative implication, as they imply that institutional reforms that aim to increase social welfare and promote development should concentrate on relaxing the ruler's binding incentive constraint. Reforms that focus on the non-binding constraint—for instance, by improving courts when State power is unconstrained, or constraining the ruler's discretion when State power is already weak—will have no effect on development (or might even harm it).

This implication is consistent with the experience of institutional reforms and their effects on economics development in post-Mao China. After the mid-1970s, the new Chinese governing élite inherited from Mao's Cultural Revolution highly inefficient and predatory institutions. As described by several authors in detail (Montinola et al., 1995; Weingast, 1995; Qian, 2003; Xu, 2011), the new regime headed by Deng Xiaoping enacted a set of institutional reforms that *de facto* increased the protection of property rights, while leaving enforcement institutions, and particularly the judiciary, relatively underdeveloped until very recently. The regime faced an urgent need to increase the economic well-being of citizens (otherwise, the risk of massive revolts was extremely high), but lacked the knowledge about the appropriate local economic constraints; on the other hand, local/regional Communist party chiefs had this knowledge but lacked

[13] See MacLeod (2007), and Malcomson (2013), for a review of the theoretical literature on relational contracting, and Gil and Zanarone (2015, 2016) for a review and critical discussion of the empirical evidence.

[14] $R^P < R^S$ only guarantees weak optimality of private ordering because as shown in Proposition 3, the two enforcement regimes are equally optimal for δ large enough.

incentives to encourage private initiative and the development of the elements of the market crucial to get the sustained economic growth going. Maskin et al. (2000) and Xu (2011) convincingly argue that the incentive system put in place by the governing élite – the regionally-decentralized promotion tournament for regional Communist Party chiefs – was a key building block in triggering growth in China. Under this system, regional Party chiefs whose region exhibited higher-than-average economic growth rate were promoted into top management ranks of the Party, whereas their counterparts whose regions grew slower than average were demoted to sub-regional Party levels (see Xu (2011): 1098-1105, and esp. his Table 3).

Our interpretation is that this system created a strong *de facto* constraint on the expropriation by local Party chiefs: given that a local Party chief wanted to get promoted, this tournament system allowed him to credibly commit not to expropriate the output from productive opportunities. This encouraged the exploitation of such opportunities by private citizens. Thus, before these reforms, the binding constraint that held back Chinese growth was the non-expropriation one: private productive opportunities went underexploited because citizens (correctly) believed that the local Communist Party leaders would not hesitate to expropriate their fruits. However, once the reforms were put in place, the promotion incentives of the regional Party leaders were aligned with the desire of private citizens to exploit these productive ventures. And this occurred despite very weak legal institutions (dismantled during the Cultural Revolution), because such weakness was not the binding institutional constraint. In fact, Xu (2011) writes: "The coexistence of very fast-growing businesses, including the private sector, and a very weak formal legal sector [in China] is puzzling. The solution to this puzzle lies in the fact that regionally decentralized administrative measures step in as substitutes for law and law enforcement" (p. 1130).

There are two plausible alternative explanations for this spurt in Chinese growth performance. The first is that the growth take-off in China was triggered not by the regional-tournament reform but by globalization and FDI; in other words, it could be that the desire to exploit the newly opened Chinese market triggered large-scale FDI which in turn stimulated economic growth. However, Qian (2003: 299) explains that throughout 1980s (i.e. when the growth take-off was under way), FDI into China was still very small. Moreover, growth acceleration happened in virtually all the Chinese regions, whereas FDI was concentrated mostly in the coastal areas, which did not exhibit faster growth that the rest of regions.

Second alternative explanation is that the take-off was mainly driven by reforms in agriculture, and not by other elements of institutional reform. This is plausible, given that the agricultural sector accounted for over 70 per cent of employment in China in the late 1970s (Qian 2003: 301). However, this explanation is also incomplete, since manufacturing and services sectors (and not agriculture) accounted for the bulk of the aggregate growth in Chinese GDP throughout 1980s and 1990s (Qian 2003: 302).

Recently, however, there are indications by numerous scholars (Peerenboom, 2002; Clarke et al., 2008; Xu, 2011) that to maintain the growth performance of China in the future, it has become urgent to shift the focus of reforms on modernizing its legal institutions. For instance, Xu (2011) argues that "administration-based regulatory decentralization is not always effective, and it is not a long-term substitute for law enforcement… Without a properly developed legal system, many problems cannot be resolved by regional competition, regional experimentation, personnel control, and other methods deployed by the RDA [regionally-decentralized authoritarian] regime… Reform in this area [i.e. legal institutions] is among the slowest and weakest, and this slow pace has caused and will continue to cause severe socioeconomic problems. As the private sector and markets become fundamentally important to the economy, the negative impacts of bad laws and the absence of the rule of law will become even more manifest" (pp. 1132-33, 1140).

This prediction emerges naturally in the framework of our model: once the binding institutional (non-expropriation) constraint is sufficiently relaxed, it is the enforcement constraint that starts to hamper productive exchanges between private agents. From that point on, the attention of institutional reforms should switch to relaxing the enforcement constraint, in other words, to improving the legal institutions (e.g. creating faster and more predictable court procedures to settle disputes).

4.2. Optimal enforcement mechanisms

As discussed before, a key implication of our analysis is that the State should act as an enforcer when it is powerful enough to be able to enforce at low cost. Otherwise, the threat of State punishment against violations is not credible, and contracts should be enforced privately.

This result helps explaining one of the major puzzles in the historical evolution of enforcement institutions in Europe: the emergence and disappearance of the private-enforcement system known as the Law Merchant.[15] According to Milgrom et al. (1990), Greif (2006), and other authors, under the Law Merchant system, breaches of commercial contracts were punished by coordinated traders' boycotts, rather than by the State. While the Law Merchant seemed a successful institutional arrangement in the Middle Ages, it was subsequently replaced by public enforcement institutions, where judicial rulings on contractual disputes between merchants were backed by the State's coercive power (Masten and Prufer, 2014).

According to Proposition 3 in our model, improvements in the ruler's enforcement technology should favor the State over private ordering. In the Middle Ages, states were characterized by a feudal structure where each one of multiple rulers controlled a portion of the State's territory. As a result, the ability of each ruler (including the king, who was a "primus inter pares") to exert coercion within the State was limited to its primary sphere of influence. Our model then predicts that in Medieval times, the Law Merchant system should have been used for long-distance transactions, whereas state enforcement should have been used for more local ones.

Around the XVI century, two large-scale, interconnected historical changes generated an increase in the scope of rulers' coercive power. First, the rise of the centralized states in Europe implied consolidation of coercive power and the elimination of overlapping, fragmented jurisdictions (Tilly, 1990). Second, warfare between European rulers implied substantial improvements in the coercion technology (Blaydes and Chaney, 2013; Onorato et al., 2014), which further reinforced consolidation (Tilly, 1990; Gennaioli and Voth, 2015). These changes contributed to an increase both in the geographic scope of State rulers' coercive power, and in their ability to exert coercion within the state's territory. According to our model, this should have unambiguously lead to the replacement of the Law Merchant system by state enforcement.

Research by legal historians supports both our predictions on the choice between Law Merchant and state enforcement across different types of transactions, and on the timing of the disappearance of the Law Merchant and its replacement by the state enforcement system.[16]

[15] Our explanation for this dynamic historical process is based on a comparative statics result over optimal stationary equilibria of a repeated game, similar in method to numerous other analyses in economics and political science. This approach weighs the analytical tractability of the model against the downside of remaining silent about the process of transition. As explained by Dixit (2004): "[these] models of repeated games under stationary conditions… describe how an institution of governance functions, or how two institutions can coexist, once all traders' expectations and actions have adjusted to this fact. However, the process whereby a society changes from one institution to another is dynamic. […] Dynamic games are far more complex than repeated games, and require different approaches and techniques, for example evolutionary theory, stochastic processes, and computer simulations" (p. 20).

[16] Another explanation, complementary to ours, for the rise and fall of the law merchant has been suggested by Masten and Prüfer (2014). They argue that the evolution from local to long-distance trade may have increased the merchants' cost of verifying other merchant's violations, thus favoring State enforcement systems that do not rely on coordinated boycotts as a punishment.

In her detailed study of the evolution of the Law Merchant, Cutler (2003) writes: "While local transactions were heavily regulated by political authorities, long-distance trade was largely immune to the application of local laws and was governed by the law merchant. [...] In addition to simply being unable to regulate international transactions in any significant way, the local authorities were unwilling to do so [...] [because] the distinguishing feature of medieval Europe was the decentralization of political authority, overlapping feudal jurisdictions, plural allegiances, and asymmetrical suzerainties" (pp. 109, 118, 139).

Moreover, Cutler (2003) argues that with the increasing centralization of states' power, the enforcement system optimally changed, away from the Law Merchant and towards State-based enforcement: "The emergence of states and their attempts to nationalize and to control foreign commercial activities signaled a change in both the ability and the willingness of political authorities to regulate international transactions. [...] This is evident in the priority given to positive law as the most appropriate mechanism for regulating international commerce and the displacement of custom as a primary source of law. [...] *Effective enforcement came to be associated with the state*" (pp. 140–142).

5. Conclusion

Coercive power has an ambiguous social role. On one hand, it encourages productive investment by enabling the punishment of opportunistic behavior. On the other hand, it discourages such investment by permitting expropriation. This ambiguity between the enforcement and the predatory roles of the State has been noted by political economists. For instance, Weingast (1995) describes it as "the fundamental political dilemma", while Djankov et al. (2003a) label it as the "tradeoff between the costs of disorder and those of dictatorship". Yet, this dilemma remains understudied in economic models of the State, most of which focus on the predation costs of coercive power (e.g., Greif et al., 1994; Acemoglu, 2003; Besley and Persson, 2011a), while abstracting from its potential upside in terms of enhanced social order.

This paper has built a framework for studying economic exchanges in the shadow of a ruler's coercion. We have shown that, in the presence of repeated interactions, a State where the ruler uses power to enforce contracts, and abstains from using it to expropriate the gains from trade, can arise as a self-enforcing equilibrium. We have also show that, consistent with the existing historical and cross-country evidence, there is a tradeoff between the two dimensions of the ruler's coercive power—contractual enforcement and expropriation. When his power is politically constrained, the ruler is not tempted to expropriate but is tempted to shirk on costly enforcement, so it might be optimal to replace State enforcement with private ordering. As the ruler's political power grows, his temptation not to enforce diminishes while the temptation to expropriate grows, so State enforcement becomes more attractive. At high enough levels of political power, the ruler's binding incentive constraint is that on expropriation. In this case, lowering legal procedural complexity (which would relax the ruler's incentive constraint on enforcement) fails to increase social surplus, and might, contrarily, reduce it by making the expropriation easier.

Our model can be extended in several directions. First, one may allow the ruler to also enter productive contracts with the agents. Along this lines, in a companion paper (Aldashev and Zanarone, 2015) we compare the productivity of private firms, where powerless managers and employees contract with each other, and public firms, where managers and employees directly contract with the ruler or elites. We show that in private firms, the powerless agents can rely on the ruler to enforce their contracts, but they are also subject to a risk of expropriation. Conversely, in public firms, contracts must be enforced via private ordering because the ruler cannot be coercively punished, but the threat of expropriation disappears.

A second potential promising extension of the model is to open the "black box" of judicial/procedural complexity (parameter q in the current analysis) by making such complexity endogenous, and by allowing it to vary depending on whether the dispute to be resolved by judges is between citizens or between citizens and the ruler. That would allow us to disentangle adjudication institutions ("Who verifies contractual breach?") from enforcement institutions ("Who punishes violations?") and study how these two types of institutions are jointly determined. In particular, it would be interesting to determine to what extent the ruler would want to separate the two types of procedural institutions. From an empirical standpoint, this extension may provide valuable insight into how different legal systems have simultaneously chosen between arbitrators and courts as adjudicators of disputes, and between private ordering and State coercion as enforcement mechanisms, in the course of history (Cutler, 2003).

Finally, the model may be extended to study the provision of incentives in firms and organizations. Given its ownership of assets and its power to terminate employment relationships and to allocate tasks and rewards (Holmstrom and Milgrom, 1994), the firm may be seen as a powerful "ruler". The firm's CEO may use his power to expropriate managers and employees (for instance, by changing piece rates or withdrawing discretionary bonuses and promotions), but also to enforce internal contracts between divisional managers and their subordinates (for instance, by immediately firing a manager who fails to promote or pay the subordinate as promised, even when a replacement for the manager cannot be readily found, so that termination is costly for the firm). This may create a tradeoff between "private ordering" governance, where the promise of future rents is used to both enforce internal contracts and deter expropriation, and "State-like" firms, where future rents are used to deter expropriation while costly punishments are used to enforce internal contracts.

Acknowledgments

We are grateful to Robert Gibbons for extensive advice and suggestions. We also thank Farid Toubal for sharing the FDI data, and Maitreesh Ghatak (the Editor), an anonymous referee, Benito Arruñada, Tim Besley, Alessandro Bonatti, Ethan Bueno de Mesquita, Antonio Cabrales, Jonathan Conning, Oscar Contreras, Avner Greif, Carmine Guerriero, Ruitian Lang, Thierry Mayer, Florian Mayneris, Dilip Mookherjee, Roger Myerson, Pablo Montagnes, Jean-Philippe Platteau, Debraj Ray, Heikki Rantakari, Lorenzo Sacconi, Ken Shepsle, Giancarlo Spagnolo, Arthur Silve, Guido Tabellini, Kaj Thomsson, Vincenzo Verardi, John Wallis, Stephane Wolton, Barry Weingast, and seminar audiences at Chicago (Harris), MIT, CUNY-Hunter College, Bocconi, Stockholm School of Economics, Carlos III, Ottawa, Tilburg, Turin, Namur, Cergy-Pontoise, and at the AEA, ALEA, THRED, ISNIE, ACLE, and DIAL conferences, for useful comments. This study received financial support from the Spanish Ministry of the Economy and Competitiveness through grant ECO2014-57131-R.

Appendix A

Construction of the FDI attractiveness measure

We construct the measure of FDI attractiveness as follows. We obtained the value of bilateral inward FDI stocks (in constant USD) of all countries worldwide, for the 1991–2005 period, from the World Investment Directory of the United Nations Conference on Trade and Development (UNCTAD). Given that for many countries and years these values are equal to zero, we add 1 to all the values (a common procedure in empirical trade literature). Next, we estimate the following standard gravity equation (Head and Mayer, 2014):

$$Log(1 + InwardFDIstock_{ijt}) = \alpha_{it} Sendingcountry_{it} + \delta_{jt} \mathrm{Re}\, ceivingcountry_{jt} + X'_{ij}\boldsymbol{\beta} + \varepsilon_{ijt}$$

Here, *Sending country*$_{it}$ is a country-year fixed effect for investing country i in year t, *Receiving country*$_{jt}$ is a country-year fixed effect for recipient country j in year t, X_{ij} is the vector of usual pair-specific, time-invariant gravity controls (contiguity, geographic distance, common language—official and spoken by at least 9 per cent of the population in both countries in the pair— and dummies for being in a colonial relationship, having had a common colonizer, and having been part of the same country, in the past), ε_{ijt} is the error term, and α_{it}, δ_{jt} and $\boldsymbol{\beta}$ are parameters to be estimated. Finally, we recover the estimated recipient country-year fixed effects, and calculate their means for each country in Acemoglu and Johnson (2005) sample. This is done for two reasons: the institutional quality measures (and their instruments) are time-invariant; moreover, it is well known that annual FDI statistics can be strongly influenced by large individual deals. We denote the obtained measure as "Mean FDI attractiveness for the 1991–2005 period".

Two remarks about this measure are of order here. First, we believe that the FDI is a more direct (and thus a better) proxy for the strength of incentives for productive agents than output per capita. As noted by Dixit (2011), the quality of institutions is likely to play an important role for the FDI decisions of foreign firms, given that "when a multinational establishes a subsidiary and opens a plant in a foreign country, the whole capital stock is at risk from violations of property rights and contracts". For comparison, however, we also report the results of regressions with output per capita as the dependent variable. Second, the country fixed-effects recovered from the above gravity equation are a more accurate measure of FDI attractiveness than, for instance, the simple 1991–2005 average of FDI flows, because they avoid biases arising from larger FDI flows into countries that happen to be geographically and historically closer to large economies (see Benassy-Quere et al. (2007) and Head and Mayer (2014) for a detailed discussion of this and other related problems).

Description of the sample and control variables

We use the original sample of former European colonies as used by Acemoglu and Johnson (2005). In the instrumental-variables regression analysis, we use log population density in 1500s (the second instrument employed by Acemoglu and Johnson (2005)) instead of log settler mortality (their first instrument), in order to maximize the sample size. Similarly, due to sample-size concerns, among the proxies for the quality of legal institutions used by Acemoglu and Johnson (2005) we opt for the World Bank index of procedural complexity, rather than the index of legal formalism from Djankov et al. (2003b). Overall, this gives us a sample of 69 countries instead of 51.

In columns 5 and 6 of Table 1 (and in columns 3 and 6 of Table A3) we add into the specification the dominant religion measures and whether a country is landlocked, as controls. These were also used by Acemoglu and Johnson (2005) and are the standard controls used in the empirical literature focusing on the long-run comparative development.

Fig. A1 shows the histogram of one of our main dependent variables (mean FDI attractiveness), whereas Table A1 presents the summary statistics for the main variables of analysis. We can see that both FDI attractiveness and log GDP per capita in 2003 (our second dependent variable) exhibit substantial variation across countries in the sample.

Table A2 shows the categorization of the countries in the sample by procedural complexity and levels of constraints on the executive, whereas Table A3 presents the results of OLS regressions (using the same model specification as in Table 1 but without employing the instrumental-variables technique).

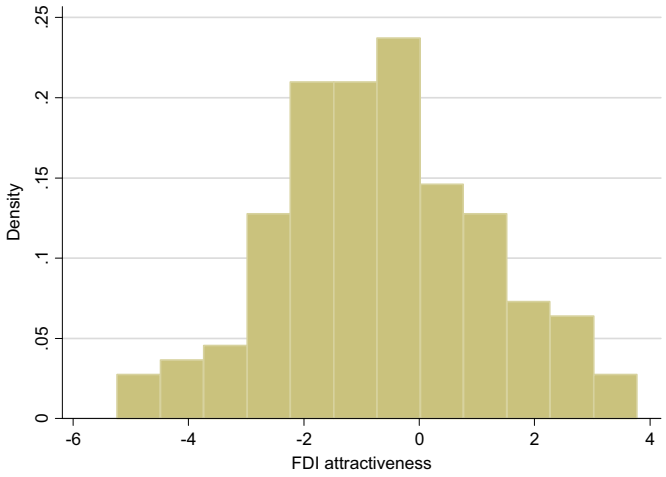

Fig. A1. Histogram of the mean FDI attractiveness, 1991–2005. *Notes*: The figure shows the histogram of the mean FDI attractiveness for the countries in our sample (ex-colonies). The construction of this variable is explained in the text of Appendix A (section "Construction of the FDI attractiveness measure").

Table A1
Summary statistics of main variables.

Variable	Number of observations	Mean	Standard deviation	Min	Max	Percentiles	
						10%	90%
Mean FDI attractiveness, 1991-2005	85	-0.59	1.80	-4.97	3.78	-3.32	3.52
Log GDP per capita, 2003	88	6.91	1.42	4.44	10.47	4.78	10.09
Constraints on the executive, average 1990s	87	4.28	1.86	1.00	7.00	1.00	7.00
Index of legal procedural complexity	70	5.94	1.54	2.90	9.03	2.92	8.19
UK legal origin	88	0.39	0.49	0.00	1.00	0.00	1.00
Log population density in 1500s	84	0.53	1.61	-3.83	4.61	-2.44	3.22

Table A2
Classification of countries (ex-colonies) by constraints on the executive and legal procedural complexity.

Constraints on the executive, 1990s	1–1.9	2–2.9	3–3.9	4-4.9	5-5.9	6-6.9	7
Legal procedural complexity below median	Rwanda Nigeria	Sierra Leone Burundi Cote d'Ivoire Ethiopia	Kenya Vietnam Tunisia Singapore Zimbabwe Egypt Ghana Malawi	Malaysia Zambia Bangladesh	Benin Sri Lanka Pakistan	Brazil Colombia	Australia Canada New Zealand Jamaica Papua New G. United States India Botswana Uruguay South Africa
Legal procedural complexity above median	Togo Chad	Cameroon Burkina Faso Algeria Guinea Indonesia Morocco	Tanzania Angola Congo, Rep. Cambodia Senegal Mozambique Peru	Guatemala Niger Haiti Mexico Mali	Honduras El Salvador Argentina Dominican Rep. Venezuela Madagascar	Nepal Panama Nicaragua Paraguay Philippines Ecuador	Chile Bolivia Costa Rica
No data on procedural complexity	Libya Dem.Rep. Congo Sudan Swaziland	Bhutan Gabon Gambia	Mauritania Lao PDR Eritrea Guinea-Bissau Central Afr. Rep.	Guyana Comoros Lesotho	Namibia	Fiji	Trinid. and Tob. Mauritius

Table A3
Effect of non-expropriation and enforcement institutions on FDI attractiveness and income per capita (OLS regression results).

	(1)	(2)	(3)	(4)	(5)	(6)
	FDI attractiveness, mean 1991-2005	FDI attractiveness, mean 1991-2005	FDI attractiveness, mean 1991-2005	Log GDP per capita, 2003	Log GDP per capita, 2003	Log GDP per capita, 2003
Constraints on executive (avg. for 1990s)	0.226(0.130)*	1.048(0.446)**	1.256(0.515)**	0.454(0.074)***	0.974(0.256)***	1.070(0.254)***
Legal institutions: Procedural complexity	-0.099(0.132)	0.605(0.413)	0.730(0.500)	-0.050(0.092)	0.395(0.187)**	0.355(0.183)*
Interaction term		-0.145(0.076)*	-0.183(0.092)*		-0.092(0.040)**	-0.122(0.042)***
Catholics as % of population in 1980			-0.002(0.012)			0.011(0.007)
Muslims as % of population in 1980			-0.006(0.012)			0.003(0.008)
Protestants as % of population in 1980			-0.021(0.021)			-0.010(0.016)
Dummy for landlocked country			-0.252(0.715)			-1.041(0.273)***
Constant	-0.985(0.979)	-4.985(2.426)**	-5.184(2.759)*	5.162(0.611)***	2.633(1.191)**	3.093(1.296)**
Observations	67	67	66	69	69	68
R-squared	0.06	0.11	0.13	0.34	0.38	0.52

Notes: Robust standard errors in parentheses;. For further details, see notes to Table 1 in the main text.
* significant at 10% level.
** significant at 5% level.
*** significant at 1% level.

Appendix B. Mathematical proofs

Proof of Proposition 1: private ordering

Consider an optimal POSC that in every period calls for participation by both agents and the ruler, transfers t_1, t_2 and γ, and productive action a. In the event of a deviation (on the initial terms of the social contract, on the productive action and payments, or on coercion by the ruler), the worst credible punishment under private ordering implies that agent 1 stops producing, pending payments do not take place, the ruler expropriates any available income, and the two agents exit the ruler's territory at the end of the period and never enter it again. Since deviations do not occur in equilibrium, there is no loss in assuming this worst punishment off the equilibrium path of play (Abreu, 1988).

Let u_1, u_2 and π be the two agents' and the ruler's per period expected payoffs under POSC:

$$u_1 \equiv -t_1 + b(a) - C(a), \tag{B1}$$

$$u_2 \equiv -t_2 + (1-\gamma)V(a) - b(a), \text{and} \tag{B2}$$

$$\pi \equiv t_1 + t_2 + \gamma V(a). \tag{B3}$$

Then, the expected surplus under POSC is:

$$s \equiv u_1 + u_2 + \pi = V(a) - C(a). \tag{B4}$$

POSC is self-enforcing if, and only if the following conditions hold.

i. The two agents and the ruler must be willing to participate:

$u_1 \geq 0;\ \ u_2 \geq 0;\ \ \pi \geq 0.$

ii. Agent 1 must be willing to take the scheduled action:

$$-C(a) + b(a) + \frac{\delta}{1-\delta}u_1 \geq 0.$$

iii. Agent 2 must be willing to pay the scheduled bonus:

$$-b(a) - \gamma V(a) + \frac{\delta}{1-\delta}u_2 \geq -\psi q V(a).$$

iv. The ruler must be willing not to expropriate more than scheduled from the two agents:

$$\gamma V(a) + \frac{\delta}{1-\delta}\pi \geq \psi q V(a) + \psi q b(a).$$

v. The monetary transfers must be feasible:

$t_1 \geq 0;\ \ t_2 \geq 0;\ \ b(a) \geq 0;\ \ \gamma \in [0, 1].$

If $a = 0$, conditions (i)-(v) are trivially satisfied by $t_1 = t_2 = b(0) = \gamma = 0$, so a POSC without production is self-enforcing. Consider now the case where $a = 1$, and denote the corresponding bonus as $b(1) \equiv b$. Summing up (ii)-(iv) we obtain a necessary condition for self-enforcement:

$$\frac{\delta}{1-\delta}s \geq C + \psi q b. \tag{B5}$$

If (A5) holds for some b, it must hold for the minimum b consistent with (i) and (ii), and with the ruler's limited liability, that is: $b = C$. Substituting $b = C$ into (B5), we obtain condition (EC^P), which is therefore necessary for self-enforcement. Now let the transfers be $t_1 = t_2 = 0$, and $\gamma = \delta + (1-\delta)\psi q - \frac{C}{V}$, so that (ii) and (iii) both hold with equality. Provided that (EC^P) holds, these transfers also satisfy (i), (iv) and (v), so (EC^P) is both necessary and sufficient for a POSC with production to be self-enforcing. Thus, in the optimal POSC, the agent produces if (EC^P) holds, and does not produce otherwise.

Proof of Proposition 2: the State

Consider an optimal SSC with concentrated coercive punishments that in every period calls for participation by both agents and the ruler, transfers t_1, t_2 and γ, and productive action a. Given voluntary entry and exit by the agents and the ruler's monopoly of coercive power, In the event of a deviation on the initial terms of the social contract or a deviation by the ruler, the worst credible punishment is similar to that under private ordering. In particular, if the ruler fails to offer the promised social contract, the two agents thereafter refrain from entering his territory. If the ruler offers the promised contract and an agent rejects the ruler's offer, the ruler thereafter refrains from making a new offer. If the agents honor the social contract and the ruler expropriates or harms either of them, both agents exit in the current period and never re-enter.

By definition of concentrated coercive punishments, in the event of a deviation by the two agents once the social contract is accepted—that is, failure to take the productive action or to pay the bonus the ruler punishes the deviating agent coercively in the deviation period, and all parties revert to the optimal SSC from the next period and thereafter.

We prove Proposition 2 by proving two claims. *Claim 1*: in a SSC that is optimal among all SSC with concentrated coercive punishments, the productive action is $a = 1$ if condition (EC^S) holds, and $a = 0$ otherwise. Claim *2*: the surplus under a SSC without concentrated coercive punishments cannot be larger than the surplus in a SSC with concentrated coercive punishments.

Proof of claim 1

Using the same notation as in the analysis of private ordering, a SSC with concentrated coercive punishments is self-enforcing if, and only if the following conditions hold.

a. The two agents and the ruler must be willing to participate:

$u_1 \geq 0;\ \ u_2 \geq 0;\ \ \pi \geq 0.$

b. Agent 1 must be willing to take the scheduled action:

$-C(a) + b(a) \geq -qL_1.$

c. Agent 2 must be willing to pay the scheduled bonus:

$-b(a) - \gamma V(a) \geq -qL_2 - \psi qV(a).$

d. The ruler must be willing not to expropriate (beyond the income taxes) from the two agents:

$$\gamma V(a) + \frac{\delta}{1-\delta}\pi \geq \psi qV(a) + \psi qb(a).$$

e. The threat of coercive punishment must be credible:

$$-\lambda(max\{L_1, L_2\}) + \frac{\delta}{1-\delta}\pi \geq 0.$$

f. The monetary transfers must be feasible:

$t_1 \geq 0;\ \ t_2 \geq 0;\ \ b(a) \geq 0;\ \ \gamma \in [0, 1].$

If $a = 0$, conditions (vi)-(xi) are satisfied with zero transfers and no coercive punishments, so a SSC without production is self-enforcing. Consider now the case where $a = 1$, and denote the corresponding bonus as $b(1) \equiv b$. If SSC is self-enforcing for some transfers and punishments, it must be self-enforcing for the transfers and punishments that relax conditions (vi)-(xi) as much as possible. The ruler can relax (x) by choosing the minimum punishment consistent with (viii): $L_2 = \frac{1}{q}[b - (\psi q - \gamma)V]$. Moreover, since condition (vi) must hold and is tighter than (vii), the ruler can further relax (x) by choosing $L_1 = 0$. Given $L_1 = 0$, the ruler can relax (ix) and (x) by choosing the minimum bonus consistent with (vi), which given the feasibility condition (xi), is: $b = C$. Finally, the ruler can achieve the maximum payoff, $\pi = s$, thereby relaxing (ix) and (x), by choosing the highest upfront transfers consistent with (vi): $t_1 = 0$ and $t_2 = (1 - \gamma)V - C$. Given the feasibility condition (xi), it must be that $t_2 = (1 - \gamma)V - C \geq 0$, and hence $\gamma \leq \overline{\gamma} = 1 - \frac{C}{V}$. By substitution, it is easy to check that for any given $\gamma \leq \overline{\gamma}$, these transfers and punishments satisfy the participation constraints in (vi), and they also satisfy the ruler's incentive constraints, (ix) and (x), so long as the following condition holds:

$$max\left\{\lambda\left(\frac{1}{q}[C - (\psi q - \gamma)V]\right), \psi qC + (\psi q - \gamma)V\right\} \leq \frac{\delta}{1-\delta}s. \tag{B6}$$

Let γ^* be the level of γ that relaxes (A6) as much as possible. If $\psi qC + (\psi q - \overline{\gamma})V > \lambda\left(\frac{1}{q}[C - (\psi q - \overline{\gamma})V]\right)$, the ruler's temptation to shirk on coercive punishments is non-binding, and hence $\gamma^* = \overline{\gamma}$. If $\psi qC + (\psi q - \overline{\gamma})V \leq \lambda\left(\frac{1}{q}[C - (\psi q - \overline{\gamma})V]\right)$ and $\lambda\left(\frac{1}{q}[C - \psi qV]\right) < \psi qC + \psi qV$, it is optimal to reduce γ till the two temptations are equal, that is: $\gamma^* = \underline{\gamma}$. Finally, if $\psi qC + (\psi q - \overline{\gamma})V \leq \lambda\left(\frac{1}{q}[C - (\psi q - \overline{\gamma})V]\right)$ and $\lambda\left(\frac{1}{q}[C - \psi qV]\right) \geq \psi qC + \psi qV$, the ruler's temptation to expropriate is non-binding, so it is optimal to reduce his temptation to shirk on punishments as much as possible: $\gamma^* = 0$.

Substituting γ^* into (B6) yields condition (EC^S), which is therefore both necessary and sufficient for a SSC with concentrated coercive punishments and production to be self-enforcing.

Proof of claim 2

We now show that in a state, the ruler cannot increase surplus by departing from concentrated coercive punishments. Punishments in a state may differ from concentrated coercive punishments in two ways. First, they may be *mixed*—that is, some of agent 2's post-deviation punishment may come from a reduction in his utility in the self-enforcing SSC that follows the deviation, rather than from coercion. Second, coercive punishments may be *spread* over time, rather than concentrated in one period: $L_h > 0$ for some $h > d$, where d denotes the deviation period, and the punishment subscript is dropped because as shown in the proof of claim 1, only agent 2 is punished coercively.

Let $\tilde{u}_2$ and $\tilde{\pi}$ be the utilities of agent 2 and the ruler in the self-enforcing SSC following a deviation. Let L_d be agent 2's coercive punishment in the deviation period, and $\mathcal{L} \equiv \sum_{h=d+1}^{\infty} \delta^h L_h$ the discounted stream of punishments in subsequent periods. Finally, let L^* be agent 2's punishment in the optimal SSC with concentrated coercive punishments, as analyzed above. In this more general setting, agent 2's incentive constraint (viii) is replaced by:

a. $-b - \gamma V + \frac{\delta}{1-\delta}u_2 \geq -q(L_d + \mathcal{L}) - \psi qV + \frac{\delta}{1-\delta}\tilde{u}_2.$

In turn, the ruler's punishment credibility constraint (x) is replaced by:

b. $-\lambda(L_d) - \sum_{h=d+1}^{\infty} \delta^h \lambda(L_h) + \frac{\delta}{1-\delta}\tilde{\pi} \geq 0$.

We begin by showing that spreading punishments over time cannot increase surplus. Notice that since the agent can exit the ruler's territory at the end of the deviation period, his discounted post-deviation utility cannot be smaller than the discounted residual punishment stream: $\frac{\delta}{1-\delta}\tilde{u}_2 \geq q\mathcal{L}$. Substituting $\frac{\delta}{1-\delta}\tilde{u}_2 = q\mathcal{L}$ into (xii) implies that the optimal punishment in the deviation period is the same as in the SSC with concentrated coercive punishments: $L_d = L^*$. But then, adding punishments in the subsequent periods would make credibility condition (xiii) tighter than the corresponding condition (x) in the SSC with concentrated coercive punishments. Therefore, spreading punishments over time cannot increase surplus.

We now complete the proof by showing that mixing coercive punishments with reductions in the agent's utility in post-deviation periods cannot increase surplus. Let $L_d = L$ and drop the suboptimal punishments in post-deviation periods. Substituting into (xii) yields the optimal coercive punishment:

$$L = \frac{1}{q}\left[b - (\psi q - \gamma)V - \frac{\delta}{1-\delta}(u_2 - \tilde{u}_2)\right].$$

Reverting to the self-enforcing SSC without production, where $\tilde{u}_2 = \tilde{\pi} = 0$, following a deviation by agent 2, would violate (xiii) and hence is not feasible. Let $\underline{u}$ and $\overline{\pi}$ be the agent's and the ruler's utility in the self-enforcing SSC with production that maximizes the ruler's utility. Clearly, it is optimal to choose the upfront transfer, t_2, such that $\tilde{u}_2 = \underline{u}$ and $\tilde{\pi} = \overline{\pi}$, as that relaxes (xiii) without affecting the other constraints. But if a SSC that gives utilities $\underline{u}$ and $\overline{\pi}$ to the agent and the ruler is self-enforcing, it is optimal for the ruler to also offer this contract on the equilibrium path. Thus, the ruler cannot increase surplus with mixed punishments, that is, any self-enforcing SSC with production but without concentrated coercive punishments can also be implemented with concentrated coercive punishments, that is, by choosing t_2 such that $\tilde{u}_2 = u_2 = \underline{u} = 0$ and $\tilde{\pi} = \pi = \overline{\pi} = s$.

Proof of Proposition 3

Let δ^S and δ^P be the smallest discount factors such that (EC^S) and (EC^P) hold, respectively:

$$\delta^S \equiv \frac{max\{R^H, R^V\}}{s + max\{R^H, R^V\}},$$
$$\delta^P \equiv \frac{R^P}{s + R^P}.$$

The fact that $R^P \neq max\{R^H, R^V\}$ ensures that $\delta^S \neq \delta^P$. Define:

$$\underline{\delta} \equiv min\{\delta^P, \delta^S\},$$
$$\overline{\delta} \equiv max\{\delta^P, \delta^S\}.$$

For $\delta \in [0,(\underline{\delta})$ neither (EC^P) nor (EC^S) hold, so propositions 1 and 2 imply that surplus is zero under both private ordering and the state. For $\delta \in [\underline{\delta},(\overline{\delta})$, surplus is $s = V - C$ under private ordering and zero in the state if $\underline{\delta} = \delta^P$, whereas surplus is s in the state and zero under private ordering if $\underline{\delta} = \delta^S$. Finally, for $\in[\overline{\delta},1]$, surplus is s under both private ordering and the state.

Proof of Proposition 5

Let $R^H(\gamma)$ and $R^V(\gamma)$ be, respectively the ruler's non-enforcement and expropriation temptations as a function of γ. Suppose $=0$. Then, $R^H(0) > R^V(0)$, which implies that it is optimal to set $\gamma^* = 0$, and the non-enforcement temptation is binding:

$$R^S = R^H(\gamma^*) > R^V(\gamma^*).$$

Suppose now that $\psi q = 1$. Then, $R^V(\overline{\gamma}) > R^H(\overline{\gamma})$, which implies that it is optimal to set $\gamma^* = \overline{\gamma}$, and the expropriation temptation is binding:

$$R^S = R^V(\gamma^*) > R^H(\gamma^*).$$

As ψq grows from zero to one, $R^H(\gamma)$ decreases, and $R^V(\gamma)$ increases, for any given γ. Thus, there must be $\widetilde{\psi q} \in (0,1)$ such that $R^S = R^H(\gamma^*)$ if, and only if:

$$q < \frac{\widetilde{\psi q}}{\psi}. \tag{B7}$$

At $\psi = 0$, (B7) holds for all q, so a marginal increase in q reduces the state temptation, $R^S = R^H(\gamma^*)$, and thus cannot reduce production and surplus. In contrast, at high enough levels of ψ, increases in q cause condition (B7) to be violated. At that point, a marginal increase in q raises the state temptation, $R^S = R^V(\gamma^*)$, and thus cannot increase production and surplus.

Appendix C. Supporting information

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.jdeveco.2017.05.002.

References

Abreu, D., 1988. On the theory of infinitely repeated games with discounting. Econometrica 56 (2), 383–396.
Acemoglu, D., 2003. Why not a Political Coase Theorem? Social conflict, commitment, and politics,. J. Comp. Econ. 31, 620–652.
Acemoglu, D., Johnson, S., 2005. Unbundling institutions. J. Polit. Econ. 113, 949–995.
Acemoglu, D., Johnson, S., Robinson, J., 2001. The colonial origins of comparative development: an empirical investigation. Am. Econ. Rev. 91, 1369–1401.
Acemoglu, D., Johnson, S., Robinson, J., 2002. Reversal of fortune: geography and institutions in the making of the modern world income distribution. Q. J. Econ. 117,

1231–1294.
Acemoglu, D., Johnson, S., Robinson, J., 2005. The rise of europe: international trade, atlantic change, and economic growth. Am. Econ. Rev. 95, 546–579.
Acemoglu, D., Robinson, J., 2008. Persistence of power, elites, and institutions. Am. Econ. Rev. 98, 267–293.
Acemoglu, D., Wolitzky, A., 2015. Sustaining Cooperation: Community Enforcement vs. Specialized Enforcement, NBER Working paper 21457, August.
Aldashev, G., Zanarone, G., 2015. Public and Private Firms in the Shadow of Coercive Power. Université libre de Bruxelles, (Working paper, ECARES).
Auer, R., 2013. Geography, institutions, and the making of comparative development. J. Econ. Growth 18, 179–215.
Besley, T., Persson, T., 2011a. Fragile states and development policy. J. Eur. Econ. Assoc. 9, 371–398.
Besley, T., Persson, T., 2011b. Pillars of Prosperity: The Political Economics of Development Clusters. Princeton University Press, Princeton, NJ.
Benassy-Quere, A., Coupet, M., Mayer, T., 2007. Institutional determinants of foreign direct investment. World Econ. 30, 764–782.
Bernstein, L., 1992. Opting out of the legal system: extralegal contractual relations in the diamond industry. J. Leg. Stud. 21, 115.
Blaydes, L., Chaney, E., 2013. The Feudal Revolution and Europe's Rise: political divergence of the christian west and the muslim world before 1500 CE. Am. Polit. Sci. Rev. 107, 16–34.
Clarke, D., Murrell, P., Whiting, S., 2008. The Role of Law in China's Economic Development,. In: Brandt, L., Rawski, T. (Eds.), China's Great Economic Transformation. Cambridge University Press, Cambridge, 319–361.
Cutler, C., 2003. Private Power and Global Authority: Transnational Merchant Law in the Global Political Economy. Cambridge University Press, Cambridge, UK.
De Figueiredo, R., Weingast, B., 2005. Self-enforcing federalism. J. Law Econ. Organ. 21, 103–135.
Dincecco, M., Federico, G., Vindigni, A., 2011. Warfare, taxation, and political change: evidence from the Italian Risorgimento. J. Econ. Hist. 71, 887–914.
Dixit, A., 2003a. On modes of economic governance. Econometrica 71, 449–481.
Dixit, A., 2003b. Trade expansion and contract enforcement. J. Polit. Econ. 111, 1293–1317.
Dixit, A., 2004. Lawlessness and Economics. Princeton University Press, Princeton, NJ.
Dixit, A., 2011. International trade, foreign direct investment, and security. Annu. Rev. Econ. 3, 191–213.
Djankov, S., La Porta, R., Lopez-De-Silanes, F., Shleifer, A., 2002. The regulation of entry. Q. J. Econ. 117, 1–37.
Djankov, S., Lopez-De-Silanes, F., Glaeser, E., La Porta, R., Shleifer, A., 2003a. The new comparative economics. J. Comp. Econ. 31, 595–619.
Djankov, S., La Porta, R., Lopez-De-Silanes, F., Shleifer, A., 2003b. Courts. Q. J. Econ. 118, 453–517.
Ellickson, R., 1991. Order without Law: How Neighbors Settle Disputes. Harvard University Press, Cambridge, MA.
Engerman, S., Sokoloff, K., 1997. Factor Endowments, Institutions, and Differential Paths of Growth Among New World Economies: a View from Economic Historians of the United States,. In: Haber, S. (Ed.), How Latin America Fell Behind: Essays on the Economic Histories of Brazil and Mexico, 1800-1914. Stanford University Press, Stanford, CA.
Fearon, J., 2011. Self-enforcing democracy. Q. J. Econ. 126, 1661–1708.
Gennaioli, N., Voth, H.J., 2015. State capacity and military conflict. Rev. Econ. Stud. 82, 1409–1448.
Gibbons, R., Rutten, A., 2007. Hobbesian Horseraces. MIT, (Working paper).
Gil, R., Zanarone, G., 2015. On the Determinants and Consequences of Informal Contracting. Johns Hopkins University, (working paper).
Gil, R., Zanarone, G., 2016. New frontiers in the empirical research on informal contracting. J. Inst. Theor. Econ. 172, 390–407.
Glaeser, E., Shleifer, A., 2002. Legal origins. Q. J. Econ. 117, 1193–1229.
Greif, A., 2006. Institutions and the Path to the Modern Economy: lessons from Medieval Trade. Cambridge University Press, New York.
Greif, A., Milgrom, P., Weingast, B., 1994. Coordination, commitment, and enforcement: the case of the merchant guild. J. Polit. Econ. 102, 745–776.
Hadfield, G., Weingast, B., 2012a. What is law? A coordination model of the characteristics of legal order. J. Leg. Anal. 4, 471–514.
Hadfield, G., Weingast, B., 2012b. Law without the State: legal attributes and the coordination of decentralized collective punishment. J. Law Court. 1, 3–34.
Head, K., Mayer, T., 2014. Gravity Equations: Workhorse, Toolkit, and Cookbook,. In: Gopinath, Helpman, Rogoff (Eds.), Handbook of International Economics 4. Elsevier, Amsterdam.
Holmstrom, B., Milgrom, P., 1994. The firm as an incentive system. Am. Econ. Rev. 84, 972–991.
Hurwicz, L., 2008. But who will Guard the Guardians? Am. Econ. Rev. 98, 577–585.
Kosfeld, M., Rustagi, D., 2015. Leader punishment and cooperation in groups: experimental field evidence from commons management in Ethiopia. Am. Econ. Rev. 105, 747–783.
Porta, La, Lopez-De-Silanes, R., F., Shleifer, A., 2008. The economic consequences of legal origins. J. Econ. Lit. 46, 285–332.
Levin, J., 2003. Relational incentive contracts. Am. Econ. Rev. 93, 835–857.
Levine, D., Modica, S., 2016. Peer discipline and incentives within groups. J. Econ. Behav. Organ. 123, 19–30.
MacLeod, B., 2007. Reputations, relationships, and contract enforcement. J. Econ. Lit. 45, 595–628.
MacLeod, B., Malcomson, J., 1989. Implicit contracts, incentive compatibility, and involuntary unemployment. Econometrica 57, 447–480.
Malcomson, J., 2013. Relational Incentive Contracts,. In: Gibbons, R., Roberts, J. (Eds.), The Handbook of Organizational Economics. Princeton University Press, Princeton.
Masten, S., Prufer, J., 2014. On the evolution of collective enforcement institutions: communities and courts. J. Leg. Stud. 43, 359–400.
Maskin, E., Qian, Y., Xu, C, 2000. Incentives, information, and organizational form. Review of Economic Studies 67 (2), 359–378.
Milgrom, P., North, D., Weingast, B., 1990. The Role of institutions in the revival of trade: the law merchant, private judges, and the champagne fairs. Econ. Polit. 2, 1–23.
Montinola, G., Qian, Y., Weingast, B., 1995. Federalism, Chinese style: the political basis for economic success in China. World Polit. 48, 50–81.
Mookherjee, D., 2013. Incentives in hierarchies,. In: Gibbons, R., Roberts, J. (Eds.), Handbook of Organizational Economics. Princeton University Press, Princeton, NJ.
North, D., 1981. Structure and Change in Economic History. Norton, New York.
North, D., Wallis, J., Weingast, B., 2009. Violence and Social Orders: a Conceptual Framework for Interpreting Recorded Human History. Cambridge University Press, Cambridge.
Olson, M., 1993. Dictatorship, democracy, and development,. Am. Polit. Sci. Rev. 87, 567–576.
Onorato, M., Scheve, K., Stasavage, D., 2014. Technology and the era of the mass army. J. Econ. Hist. 74, 449–481.
Ostrom, E., 1990. Governing the Commons: the Evolution of Institutions for Collective Action. Cambridge University Press, New York.
Ostrom, E., Walker, J., Gardner, R., 1992. Covenants with and without a sword: self-governance is possible. Am. Political Sci. Rev. 86, 404–417.
Ottone, S., Ponzano, F., Zarri, L., 2015. Power to the people? An experimental analysis of bottom-up accountability of third-party institutions. J. Law Econ. Organ. 31, 347–382.
Peerenboom, R., 2002. China's Long March Toward Rule of Law. Cambridge University Press, Cambridge, UK.
Qian, Y.Y., 2003. How Reform Worked in China. In: Rodrik, D. (Ed.), In Search of Prosperity: Analytic Narratives on Economic Growth. Princeton University Press, Princeton NJ.
Rahman, D., 2012. But who will monitor the monitor? Am. Econ. Rev. 102, 2767–2797.
Thomas, J., Worrall, T., 1994. Foreign direct investment and the risk of expropriation. Rev. Econ. Stud. 61, 81–108.
Tilly, C., 1990. Coercion, Capital, and European States, AD 990-1990. Wiley Blackwell, New York.
Weingast, B., 1995. The economic role of political institutions: market-preserving federalism and economic development. J. Law Econ. Organ. 11, 1–31.
Williamson, O., 1991. Comparative economic organization: the analysis of discrete structural alternatives. Adm. Sci. Q. 36, 269–296.
Xu, C., 2011. The fundamental institutions of China's reforms and development. J. Econ. Lit. 49, 1076–1151.