Chapter ?

The use of coercion in society: insecure property rights, conflict and economic backwardness

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Abstract

This article offers an equilibrium analysis of the influence of insecure property rights on macroeconomic outcomes. The purpose of the analysis is to show how principles of economics without the ideal of the rule of law can deepen our understanding of economic backwardness and development.

1 Introduction

Are less-developed and transition economies merely less productive versions of developed economies, or is their economic order governed by significantly different rules? The bulk of the evidence supports the view that a critical difference lies in the degree of insecurity of property rights. But why are insecure property rights so inimical to economic development, and why are they so prevalent?

When property rights are insecure, economic distribution involves both coercion and voluntary contract. Traditionally, however, equilibrium theory has been concerned with analyzing the problem of the production and distribution of output taking enforceable property rights as given, focusing on understanding how voluntary contract can lead to the realization of mutual gains. The adoption of this approach, I think, underlies the disconnect between macroeconomics and development economics, and explains why the Neoclassical theory of economic growth seems incapable of explaining economic backwardness.

Unlike voluntary contracting, the use of coercion is a unilateral choice. When property rights are insecure, private agents, and the agents of the state, have an incentive to engage in predatory behavior. The anticipation of predation, in turn, provides an incentive for others to divert otherwise productive resources to protect their property against capture. Consequently, the creation of wealth and the creation of effective property rights are competing uses of scarce resources. A resource-allocation problem arises, centered on conflict over the distribution of wealth that comes with the discretionary use of coercion. Analysis of this problem is essential to understanding many issues in economic development. My approach in this article is one of deliberate focus on how equilibrium analysis of conflict can shape our thinking.

The starting point then is the observation that conflict is a general social phenomenon that is susceptible to equilibrium analysis.

> The category of conflict encompasses not only war but also crime, litigation, strikes and lockouts, and redistributive politics. Exchange and conflict theory constitute two coequal branches of economic analysis, the first based upon contract and mutual gain, the second upon contest for asymmetric advantage.
>
> [Hirshleifer, 1995]

In this article I present some basic insights about economic backwardness that can be learned from integrating conflict theory into equilibrium analyses of the production and distribution of output. In what follows, conflict will be viewed as the equilibrium sum of resources that is dissipated in the process of the creation of effective property rights. The analysis focuses on the structure of incentives, and the macroeconomic outcomes, that we may expect when property rights are insecure.

2 Evidence

> People have gradually grown used to living outside the law. Theft, illegal seizure, and factory takeovers have become everyday occurrences and do not greatly disturb people's consciences. . . . This infiltration of violence and criminality into everyday life has been accompanied by increasing poverty and deprivation. [De Soto, 1989, pp. 5-6]

The hypothesis that the rule of law — secure property rights and law and order — is vital for economic prosperity has withstood intense empirical scrutiny in the past two decades. Country-level studies consistently show that weaker rule of law is associated with lower aggregate investment and lower growth (e.g., Knack and Keefer, 1995, Mauro, 1995, Hall and Jones, 1999, Acemoglu et al., 2001).

The general role of the security of property rights — the power of individuals to control the allocation of their assets and the distribution of the returns of this allocation — is hardly controversial in development (see, e.g., North, 1990). Property rights can foster the creation of wealth — if they are enforceable. Enforcement, however, involves transaction costs associated with the protection and capture of rights. Consequently, the productive potential of given institutions must depend on the enforcement of rights, not just on their allocation. A central question is: how are property rights enforced?

In the spirit of Weber (1978 [1922]), the state is commonly viewed as having a monopoly on the legitimate use of coercion. Traditionally, economists have analyzed the problem of the production and distribution of output taking as given that the power of the state is indeed used to enforce contracts and property rights. Today, in contrast, it is widely recognized that the state's failure to enforce contracts and property rights lies at the root of economic backwardness.

A sharp distinction is made between the enforcement of contracts and that of property rights. On the one hand, in the spirit of Coase (1960) and Williamson (1985), it is now widely recognized that private contract enforcement is a critical determinant of the extent to which private agents realize mutual gains, in the absence of the ideal third-party enforcement of contracts by the state. On the other hand, the enforcement of property rights remains commonly viewed through the lens of a central-enforcer view of the world. According to this view, the main threat to the security of property lies in government itself, and the main challenge faced by less-developed and transition economies is how to acquire high-quality political institutions, which are viewed as those ensuring that rulers employ their coercive power to enforce, rather than capture, the property rights of individuals (e.g., Firmin-Sellers, 1995, Acemoglu and Johnson, 2005). However, the sharp distinction between the ability of private agents to enforce private contracts when the rule of law fails and their inability to resist predation by ruling elites is at odds with the data on actual less-developed and transition economies.

When the rule of law is weak, economic activity does not come to a halt. Normally, business networks, market intermediaries, and communal norms develop to cope with contract enforcement problems when the legal system is dysfunctional (e.g., McMillan and Woodruff, 2000, Fafchamps, 2004). When property rights over valuable resources are imperfectly delineated or insecure, private agents find ways to create and enforce property rights too. Informal arrangements among individuals develop to mitigate distributional conflict in common-pool problems (Ostrom, 1990, ch. 3), and dysfunctional legal systems promote private protection organizations (e.g., Frye and Shleifer, 1997, Frye, 2002). Membership in business organizations (Frye, 2004), and coordinated political action more generally (Putnam, 1994), can play an important role in securing property rights. Moreover, the distinction between the enforcement of contracts and that of property rights is sometimes blurred. For instance, while mafias may facilitate private contract enforcement, they may also become a threat to the security of property (e.g., Gambetta, 1993).

Yet, it is evident that self-governance mechanisms are neither automatic nor efficient, even within relatively small groups of individuals (Ostrom, 1990, ch. 5, Libecap, 1989, ch. 5-6). It is also evident that when property rights are insecure, private agents unilaterally engage in the protection and capture of rights; in contrast with the central-enforcer view of the world, the use of coercion is very much decentralized. The links between the security of property and economic behavior at the individual level have been the focus of microeconomic studies in a variety of specific institutional settings. For instance, Besley (1995) and Goldstein and Udry (2008) examine investment and productivity in rural Ghana, Field (2007) studies labor supply in urban Peru, and Johnson et al. (2002) examine investment by manufacturing firms in five transition economies. By and large the evidence supports the view that secure property rights foster the creation of wealth. More importantly, however, empirical studies consistently show that there is a critical distinction between legal and effective security of property, that effective security is remarkably heterogeneous across individuals, and that effective security and individual economic behavior are jointly determined (see, e.g., Pande and Udry, 2007).

The importance of private creation and enforcement of property rights is perhaps most apparent in the context of the unofficial economy. Estimates of the size of the unofficial economy are inherently imprecise, but they do indicate that much economic activity in less-developed and transition economies is unofficial activity, generally defined as unreported economic activity that contributes to aggregate output. For instance, Schneider (2005) estimates that the average size of the unofficial economy as a proportion of official GDP in 1999-2000 was 17 percent in the OECD countries, 38 percent in transition economies and 41 percent in developing countries. Empirical studies in the past decade consistently find that economies with a larger unofficial economy are those with weaker rule of law and higher levels of corruption, and that unofficial activity is associated with smaller and less productive firms (Friedman et al. 2000, Dabla-Norris et al., 2008). Moreover, the evidence increasingly challenges the traditional view that government taxation is the main force driving private agents away from the official economy (Johnson et al. 1997), calling instead for a deeper understanding of the joint determinants of economic behavior and the security of property, including predatory behavior by private agents and by agents of the state.

Similarly, the evidence suggests that the view of corruption as a tax misses much of the cost of corruption (Fisman and Svensson, 2007), and also trivializes the reality of corruption — the abuse of public office for private gain — in many countries, where private agents usually meet lower-level public officials, and where the enforcement of property rights is a decentralized activity (Shleifer and Vishny, 1998, Reinikka and Svensson, 2004). Private agents do not simply take corruption as given, but react to it, by establishing political connections (Faccio, 2006), and more generally, by specializing in relatively unproductive activities (Svensson, 2003, Fisman, 2001).

Neglecting how private enforcement of property rights responds to incentives can have serious consequences even in developed economies. For instance, Jaffe and Lerner's (2004) analysis of intellectual property rights in the U.S. after 1982 provides a textbook example of how well-intended legal changes can foster predatory behavior, made self-enforcing by the behavior of all parties involved. They argue that statutory changes that were designed to make valid patents easier to enforce, and to run the U.S. patent office more efficiently, instead produced a patent system that "provides incentives for applicants to file frivolous patent applications, and for the patent office to grant them. It likewise encourages patent holders to sue, and those accused of patent infringement to give in and pay under threat, even if the patent at issue is of dubious validity" (p.6).

Of course, the private and social costs of neglecting the incentive effects of insecure property rights can be increased by orders of magnitude in less-developed and transition economies. For instance, in their study of conflict associated with insecure property rights in the Brazilian Amazon, Alston et al. (2000, p. 163) conclude that "the current process of land reform may perversely encourage even more violence, the opposite outcome from what is intended". Perverse effects of emerging land markets, and land reform, on distributional conflict are well documented, e.g., in Rwanda (Andre and Platteau, 1998) and Uganda (Deininger and Castagnini, 2006). Even increases in the value of resources can exacerbate conflict in environments with insecure property rights (e.g., Homer-Dixon, 1994, Bates et al., 2002). More generally, many have noted the often unfortunate "unintended consequences" of macroeconomic policies (Easterly, 2001), anti-corruption programs (Svensson, 2005), legal reform (Ensminger, 1997, Hay and Shleifer, 1998), or democratization (Snyder, 2000) in less-developed and transition economies. My view is that incentives and general-equilibrium effects associated with conflict over economic distribution underlie those unintended consequences.

Insecure property rights are bad for development. Returning to the questions raised in the introduction, why are they so bad, and why are they so common? The bulk of the evidence, I think, suggests that an answer to these questions must recognize that weak rule of law is typically not chaos, but an economic order that follows its own rules; and that these rules are not imposed from without, but are part of an equilibrium outcome that is jointly determined with the economic order. Importantly, the evidence suggests that the decentralized creation of effective property rights, as opposed to the centralized enforcement of legal rights, plays a central role in economies with insecure property rights.[1] These observations motivate the analysis in the rest of this article.

3 The use of coercion in society: basic framework

> *Appropriating, grabbing, confiscating* what you want — and, on the flip side, *defending, protecting, sequestering* what you already have — that's economic activity too. [Hirshleifer, 1994]

In this section I introduce a basic equilibrium model of the creation of effective property rights. I consider two variants of the model. In each case the central economic problem is that of the allocation of time in a society, and the focus is on the allocation of time between activities that generate output — and claims to that output — and activities that aim to defend one's claims or to challenge those of others. The core analytical framework builds upon seminal work by Hirshleifer (1988, 1995), Skaperdas (1992) and Grossman and Kim (1995) on the economics of conflict.

3.1 Production, protection and predation

The following model is based on Grossman (2001), Dixit (2004, ch. 5) and Gonzalez (2007). Consider an economy consisting of a continuum of identical agents, with mass normalized to 1. Each agent is endowed with one unit of inalienable time. Agent i's problem is to allocate $l_i \geq 0$ units of time to the production of output, $x_i \geq 0$ units to the protection of his owns claims to output and $z_i \geq 0$ units to the challenge of the claims of other agents. These activities are alternative uses of scarce resources. Agent i's resource constraint is

$$l_i + x_i + z_i \leq 1, \tag{3.1}$$

for every agent i. Labor is transformed into output according to a production technology

$$f(l_i) = Al_i, \tag{3.2}$$

where $A > 0$ represents the productivity of labor. The production of output endows the producer with insecure claims to that output. The insecurity of these claims is what allows for two distinct non-productive activities: the protection of one's claims and the challenge of the claims of others. Only the latter is a predatory activity, but both protection and predation rely on the use of coercion as the means to enforce property rights.

To formalize the consequences of decentralized conflict over economic distribution as simply as possible, suppose that each agent competes against the economy's average. Letting l, x and z denote the average levels of labor, protection and predation in the economy, respectively, every agent i successfully defends a fraction $p(x_i, z)$ of his output and successfully appropriates a fraction $1 - p(x, z_i)$ of the economy's average output, where

$$p(x_i, z) = \frac{\pi x_i^m}{\pi x_i^m + z^m}, \text{ and } p(x, z_i) = \frac{\pi x^m}{\pi x^m + z_i^m}, \tag{3.3}$$

whenever $x+z>0$, with $\pi>0$ and $0<m\leq 1$, and $p(0,0)=p_0\in[0,1]$. The share $p(x_i,z)$ provides a natural measure of the security of agent i's claims to property. The parameter m determines the strength of the diminishing returns to protection and predation. Assuming that $m\leq 1$ ensures that each agent faces decreasing returns to each activity throughout. The parameter π measures the efficacy of the protection of property rights relative to that of predation. Protection is more effective than predation whenever $\pi>1$. As π approaches infinity each agent's private returns to productive activities become perfectly secure at a negligible cost.

At the aggregate level, all resources that are distributed in the economy must be produced by someone, and property rights over all output are enforced by someone. This requires an adding-up condition:

$$\int_0^1 \left(p(x_i,z)\,f(l_i)+(1-p(x,z_i))\,f(l)\right)di=f(l)\,, \tag{3.4}$$

where $f(l)$ is the economy-wide level of output, which coincides with average output, in this example, because the population mass has been normalized to 1.

Agent i's problem is to choose an allocation $\{l_i,x_i,z_i\}$, taking the average allocation

$\{l, x, z\}$ as given, in order to maximize his payoff

$$U_i = p(x_i, z) f(l_i) + (1 - p(x, z_i)) f(l), \tag{3.5}$$

subject to the resource constraint (3.1). Note that the adding-up condition (3.4) is automatically satisfied whenever all agents choose the same allocation $\{l, x, z\}$. This symmetric solution will be the one considered here.

The production technology (3.2), the conflict technology (3.3), and the adding-up condition (3.4), together with the agents' preferences (3.5) and their resource constraint (3.1), describe the environment within which individual decisions are made. The technology of conflict summarizes the process through which protection and predation activities translate into *effective* property rights, much like the production technology (3.2) summarizes the process through which productive inputs translate into output. An equilibrium of the model is a feasible allocation of time to work, protection and predation $\{l_i^*, x_i^*, z_i^*\}$ for each agent i such that all agents are solving their allocation problems simultaneously. I will look for a *symmetric equilibrium*, that is, a feasible allocation $\{l^*, x^*, z^*\}$ that maximizes every agent's utility taking as given that every other agent is following this allocation.

Consider the individual optimization problem for an arbitrary agent i. First, an interior choice of time allocated to protection must satisfy

$$\frac{\partial p\left(x_i, z\right)}{\partial x_i} f\left(l_i\right) = p\left(x_i, z\right) \frac{\partial f\left(l_i\right)}{\partial l_i}. \tag{3.6}$$

That is, at an interior optimum, the marginal returns to protection must be equal to the marginal returns to production. Similarly, an optimal interior choice of predation is such that the marginal returns to production and predation are equal:

$$\frac{-\partial p\left(x, z_i\right)}{\partial z_i} f\left(l\right) = p\left(x_i, z\right) \frac{\partial f\left(l_i\right)}{\partial l_i}. \tag{3.7}$$

In addition, it is optimal to use all resources, that is, $l_i + x_i + z_i = 1$, for all i.

To characterize a symmetric equilibrium, first note that symmetry requires that $x_i = x$, and $z_i = z$, for all i, and this in turn implies that $p\left(x_i, z\right) = p\left(x, z_i\right)$. Since symmetry also requires that $l_i = l$, the optimal individual choices of protection and predation must equate their marginal returns:

$$\frac{\partial p\left(x, z\right)}{\partial x} = \frac{-\partial p\left(x, z\right)}{\partial z}.$$

Since $\frac{\partial p(x,,z)}{\partial x} = \frac{m}{x} p(1-p)$ and $\frac{\partial p(x,,z)}{\partial z} = \frac{-m}{z}(1-p)p$, a symmetric equilibrium has the property that each individual allocates the same amount of time to protection and predation, that is,

$x^* = z^*$, which in turn implies that the equilibrium security of property is given by

$$p\left(x^*, z^*\right) = \frac{\pi}{\pi + 1}.$$

This fact, together with the facts that $x^* = z^*$ and $l^* + x^* + z^* = 1$, and the optimality of the choice of protection, given by (3.6), imply that the symmetric equilibrium allocation $\{l^*, x^*, z^*\}$ is given by

$$x^* = z^* = \frac{m}{\pi + 1 + 2m}, \tag{3.8}$$

$$l^* = \frac{\pi + 1}{\pi + 1 + 2m}. \tag{3.9}$$

Conflict can be simply viewed as the equilibrium sum of resources that is dissipated in the process of the creation of effective property rights, $x^* + z^*$. The equilibrium allocation (3.8)-(3.9) is the reflection of a prisoner's dilemma involving large numbers of individuals, and each individual's inability to commit is at the root of conflict. In the model each agent is precluded from committing to refrain from using coercion against others when he perceives that he has sufficient power. The "ratio" form of the conflict technology (3.3) illustrates sharply the link between imperfect commitment and conflict, for it implies that if everyone were to produce output without protecting it, each agent would have a sufficiently strong incentive to engage in predation. In turn, the equilibrium allocation reflects the close connection between property rights and externalities. The prospect of predation raises each individual's incentive to divert time towards protection, away from production. Because individuals do not internalize the effect of their choices of protection and predation on others, they all end up producing too little. Hence, the equilibrium allocation is inefficient, relative to the first-best allocation $\{l^e, x^e, z^e\} = \{1, 0, 0\}$, where all available time would be allocated to the production of output.

Conflict is not only a source of economic inefficiency, but it also distorts the structure of economic incentives in important ways. For instance, although an increase in the exogenous productivity of labor, A, raises the return to labor, it also raises the returns to protection and predation. In the present example, equilibrium labor supply is insensitive to changes in labor productivity, because the *relative* returns to production, protection and predation are unaffected by it. Instead, the equilibrium allocation is governed by the efficacy of protection relative to predation (π) and the degree of diminishing returns to these activities (m).

Remarks about modeling and interpretation.

Some of the stark features of the above equilibrium are due to the special assumptions about preferences and technologies. In particular, the property that an identical time is allocated to protection and predation in equilibrium is not robust to the introduction of various asymmetries. The assumptions that individuals are risk neutral, or that the production technology is linear are also special. The special features of the specification (3.3) are its symmetry across agents and the fact that p is homogeneous of degree zero. Alternative assumptions can be considered without altering the essence of the above model.

The assumption that protection and predation are separate activities allows for the possibly different incentives to engage in protection and predation, but alternative specifications can be considered. For instance, suppose that the problem of each agent i is to allocate an amount x_i of resources in order to secure a fraction $p(x_i, x)$ of his own output $f(1 - x_i)$ and to appropriate a fraction $1 - p(x, x_i)$ of average output $f(1 - x)$. It is easy to verify that the equilibrium supply of labor is given by (3.9), just as before, and thus the total resources allocated to conflict too remain the same. It is also easy to see that the special case where $\pi = 1$ in the present model is isomorphic to the case of conflict by appropriation from a common pool of resources. In this sense, the familiar common-pool problem can be interpreted as the problem of the creation of effective property rights in a situation where the allocation of initial claims is irrelevant.

Although predators as well as producers can benefit if actual conflict is avoided, the problem is that impersonal predation requires an individual to deal with too many potential predators to allow him to commit to create unprotected wealth. The individual may deter a few predators, but not all potential predators. The specification of conflict as a contest of each individual against the average is one simple way to capture the essence of the problem. As explained above, the "ratio" form of the conflict technology captures sharply the fact that, when property rights are insecure, individuals are unable to commit to not be opportunistic *ex post*. This leads to a hold-up problem, where the rational anticipation of predation *ex post* discourages the creation of wealth *ex ante*. However, whereas the familiar hold-up problem in the theory of the firm arises from the dependence of *ex ante* specific investments on the *ex post* distribution of the gains from trade,[2]here it discourages the commitment of resources that are expected to be captured by non-specific predators, not just commitments that are relation-specific.

In some cases, however, one may want to consider microeconomic interactions between agents more explicitly (see, for example, Section 4.3). For instance, consider the above model, but suppose that individuals are matched at random in pairs and individual i within every bilateral match secures a fraction $p(x_i, z_j)$ of his own output $f(l_i)$ and appropriates a fraction $1 - p(x_j, z_i)$ of agent j's output $f(l_j)$, for $i = 1, 2$, with $i \neq j$. Whether the agents' choices are made before or after matching, it is easy to see that (3.8) and (3.9) continue to describe a symmetric equilibrium allocation in this context. In this simple example each individual effectively interacts with one other individual with probability one, but the model can be extended to include matching frictions, and to consider multilateral matching, as well as alternative specifications of the multilateral conflict technology.[3]

The previous setting also permits an analysis of alternative settlement mechanisms in the shadow of conflict, and of open conflict, within matches. For instance, the following example characterizes open conflict as a commitment problem. Consider the case of bilateral matching and suppose a bilateral interaction consists of two stages. First, the agents allocate their resources between production, protection and predation, as described above. Then, each agent chooses unilaterally whether or not to challenge the claims of the other agent. If agent i challenges agent j's property claims, a fraction η of agent j's output is destroyed, and agent i appropriates a share $1-p(x_j, z_i)$ of agent j's remaining output $(1-\eta) f(l_j)$, with the share $p(x_j, z_i)$ accruing to agent j. If agent j's claims are unchallenged, he can consume all of it. It is easy to see that, from the viewpoint of the second stage, challenging the claims of agent j is a strictly dominant strategy for agent i as long as $z_i > 0$, $f(l_j) > 0$, and $\eta < 1$, because agent i incurs no cost, but he appropriates some positive output from agent j. Furthermore, note that each agent i is unable to commit to set $z_i = 0$ in the first stage. Consequently, in equilibrium, both agents challenge each other's claims in the second stage. Thus, open conflict is an equilibrium outcome, even though conflict is destructive and information is complete. In this simple example, open conflict comes from lack of commitment.[4]

3.2 Occupational choice

In the previous model, there is no equilibrium where some agents fully specialize in predation, or production, by choosing $z_i = 1$ or $z_i = 0$. The model can be extended to allow for equilibria with full specialization that coexist with the symmetric interior equilibrium. However, for simplicity, I consider a variant of the model that shifts the focus to the extensive margin. This model of occupational choice is a basic building block in analyses of theft (e.g., Usher, 1987), rent seeking (e.g., Murphy et al., 1993), and enforcement of property rights (e.g., Grossman, 2002), and in general the allocation of talent between productive and unproductive activities (e.g., Murphy et al., 1991, Acemoglu, 1995).

As before, suppose that there is a continuum of individuals, with size normalized to 1. In contrast with the model in the previous section, suppose that predation requires an indivisible unit of time. Thus, individuals now choose whether $z_i = 0$ or $z_i = 1$. An individual who chooses $z_i = 0$ enjoys utility

$$U_i = p(x_i, z) f(1 - x_i),$$

where $p(x_i, z)$ is given, as before, by

$$p(x_i, z) = \frac{\pi x_i^m}{\pi x_i^m + z^m},$$

whenever $x_i + z > 0$, with $\pi > 0$ and $0 < m \leq 1$, and $p(0,0) = p_0 \in [0,1]$. Suppose that n individuals choose to become predators, and note that $z = n$. For simplicity, assume that the returns to predation are shared equally among all predators. Since each producer i loses a fraction $(1 - p(x_i, n))$ of his income $f(1 - x_i)$, the average return to predation is

$$V = \frac{1}{n} \int_0^{1-n} (1 - p(x_i, n)) f(1 - x_i) \, di.$$

To find an equilibrium, first note that an optimal interior choice of protection must satisfy

$$\frac{\partial p(x_i, n)}{\partial x_i} f(l_i) = p(x_i, n) \frac{\partial f(l_i)}{\partial l_i}.$$

This is the same condition as (3.6), which equates the marginal returns to production and protection, except that now $l_i = 1 - x_i$ and $z = n$, where n is the proportion of predators. Since $\frac{\partial p(x_,, z)}{\partial x} = \frac{m}{x} p(1 - p)$, optimal protection requires that

$$m(1 - p(x_i, n)) = \frac{x_i}{1 - x_i}, \tag{3.10}$$

for all i. Accordingly, $x_i = x$, for all i, and equation (3.10) gives a unique solution for x as a function of the number of predators n. Differentiating this equation with respect to n one can verify that $\frac{dx}{dn} > 0$. Intuitively, each individual's incentive to allocate time to protection rather than work increases with the proportion of predators in the economy.

If producers and predators are to coexist in equilibrium, they must be indifferent between the two activities. With free entry in both activities, n adjusts to ensure that

$$p\left(x,n\right)f\left(1-x\right)=\frac{1-n}{n}\left(1-p\left(x,n\right)\right)f\left(1-x\right). \tag{3.11}$$

The left side of the equation is the return to production and the right side is the return to predation. To interpret this equilibrium condition, consider the effect of a marginal increase in n, taking into account the marginal effect on optimal protection, that is, taking into account that $\frac{dx}{dn} > 0$, as discussed above. Since both are proportional to average output, the level of average output does not play a direct role in the allocation of people across production and predation. Note that a change in n changes the average return to production (i.e., the left side of (3.11)) and the average return to predation (i.e., the right side of (3.11)) in the same direction. Intuitively, the returns to producers as well as to predators fall with the proportion of predators in the economy. However, the issue is what happens to the returns to production *relative to* predation. To answer this question, note that equation (3.11) implies that entry into production and predation occurs until the relative property rights of producers ($\frac{p}{1-p}$) equal the relative number of producers in the economy ($\frac{1-n}{n}$), which implies that the security of property is influenced by free entry such that

$$p\,(x, n) = 1 - n. \tag{3.12}$$

This gives a second equilibrium relationship between protection and predation, and it determines the proportion of predators as a function of the level of individual protection. Differentiating this equation with respect to x one can verify that $\frac{dn}{dx} < 0$. In this example, when individuals allocate more resources to protection, the relative returns to production rise and that induces some predators to become producers.

Since all producers make identical choices, an equilibrium is characterized by a fraction of predators n^* and an individual choice of protection $x^* = 1 - l^*$ such that each individual maximizes his utility taking as given the fraction of predators n^*. Assuming that there are diminishing returns to both protection and predation, that is, $m \leq 1$, there is exactly one pair (x^*, n^*) that solves (3.10) and (3.12) simultaneously. Using the definition of p, one can find $\{l^*, x^*, n^*\}$ as the unique solution to

$$\left(n+\frac{1}{m}\right)^m\left(\frac{1}{n}-1\right)=\pi,\ \text{ with } x^*=1-l^*=\frac{mn^*}{1+mn^*}. \tag{3.13}$$

For example, if $m=1$, we have

$$n^*=\sqrt{\left(\frac{\pi}{2}\right)^2+1}-\frac{\pi}{2},\ \text{ with } x^*=1-l^*=\frac{n^*}{1+n^*}.$$

Just like in the model in Section 3.1, predation always pays, and the equilibrium outcome is inefficient. Moreover, the equilibrium labor supply remains insensitive to changes in labor productivity. As before, this is an extreme outcome, but the more general point is that the creation of effective property rights and the structure of incentives that governs productive activity are inextricably linked in a society with insecure property rights.

4 Spontaneous economic order with insecure property rights

> Order is not a pressure imposed upon society from without, but an equilibrium which is set up from within. [Ortega y Gasset, 1927][5]

4.1 Why resources can gravitate towards their least productive uses

Self-interested individuals have an incentive to seek *private* profit. However, the extent to which private and social returns are aligned is a function of transaction costs. In particular, when the costs associated with the creation of property rights, and thus conflict, are taken into account, there is no reason why private profit-seeking behavior should automatically lead to economic efficiency. Thus, the hypothetical "invisible hand" of the market that would be conducive to efficient social allocations operates under the (political) ideal of the rule of law, in the sense of Hayek (1955). To the extent that insecure property rights and conflict underlie economic backwardness, one needs to recognize both the divergence between private and social returns and the fact that the structure of incentives *without* the ideal of the rule of law may be radically different from that under the ideal of zero transaction costs.

Baumol (1990) and Murphy et al. (1991), among others, have emphasized the importance of the allocation of talent in society, in particular, the allocation of agents according to their comparative advantage. Intuitively, talent will be misallocated when the private return to talent is relatively larger in activities with relatively lower social return. Baumol (1990) argues that the relevance of this basic mechanism is amply supported by history. However, as noted by Acemoglu (1995), a key question is what determines the relative returns to different activities? Here I will focus on this latter aspect of the central problem of the allocation of talent. The broader question to be addressed here is, absent the ideal of the rule of law, what incentive structures — and what social outcomes — can be supported by decentralized choices by atomistic agents?

To that end, consider an extension of the model in Section 3.2 to allow for two sectors, indexed by $j = 1, 2$. One interpretation of the model is in terms of the allocation of talent between production and enforcement of property rights in an economy with a formal and an informal sector, where the formal sector is the relatively more productive sector, and the two sectors are possibly characterized by different institutional environments.

There is a continuum of *ex ante* identical agents in the economy, normalized to 1. Predation requires an indivisible unit of time. Thus, each agent in sector j must choose whether $z_j = 0$ or $z_j = 1$. For simplicity, I will not index the specific agents, but only the sector, anticipating that agents of the same type in the same sector will make identical choices. Agents choose whether to become a producer or a predator, and which sector to enter, simultaneously and non-cooperatively. Let N_j denote the mass of agents, including producers and predators, in sector j, and let n_j denote the mass of predators in sector j. Accordingly, there are $N_j - n_j$ producers in each sector, with a total population of $N_1 + N_2 = 1$.

Consider differences across the two sectors in two dimensions. First, the productivity of labor is different across the two sectors. An individual who allocates l_j units of labor in sector j produces output according to

$$f_j(l_j) = A_j l_j,$$

for $j = 1, 2$, with $A_1 > A_2$. Thus, economic activity is more productive in sector 1.

Second, the conflict technology in each sector is as before, except that I assume that $m = 1$, for simplicity, and I allow the relative advantage of protection versus predation, as captured by the parameter π_j, to be sector-specific. Thus, an individual in sector j who chooses $z_j = 0$ and allocates x_j units of time to protection enjoys utility $p_j(x_j, n_j) f_j(1 - x_j)$, where

$$p_j(x_j, n_j) = \frac{\pi_j x_j}{\pi_j x_j + n_j}, \tag{4.1}$$

with $\pi_j \geq 1$, for $j = 1, 2$ and $p(0, 0) = p_0 \in [0, 1]$. Similarly, as in the one-sector model of Section 3.2, an individual in sector j who chooses $z_j = 1$ enjoys the average return to predation in sector j.

The main interest of the model lies in the fact that the economic returns in *both* sectors are determined in equilibrium. My analysis of an interior equilibrium of the model, in which some agents enter each sector, proceeds in four steps.

Step 1. Producers allocate less time to protection — and more time to production — in the more secure sector, that is, $p_1 < p_2$ *if and only if* $x_1 > x_2$.

To see why, note that, as in the one-sector model in Section 3.2, an optimal interior choice of protection in sector j must satisfy

$$\frac{\partial p_j\left(x_j, n_j\right)}{\partial x_j} f_j\left(l_j\right) = p_j\left(x_j, n_j\right) \frac{\partial f_j\left(l_j\right)}{\partial l_j}, \quad \text{for } j = 1, 2,$$

where $l_j = 1 - x_j$. These are two conditions that characterize the optimal choice of x_j in each sector j as a function of n_j. Taking derivatives, they can be rewritten as

$$1 - p_j\left(x_j, n_j\right) = \frac{x_j}{1 - x_j}, \quad \text{for } j = 1, 2, \tag{4.2}$$

which implies that, in equilibrium, $p_1 < p_2$ if and only if $x_1 > x_2$. Note that for (4.2) to hold with $0 < p_j\left(x_j, n_j\right) < 1$, it is necessary that $0 < x_j < \frac{1}{2}$, for $j = 1, 2$.

Moreover, using the definition of p_j given by (4.1) into (4.2), one can find that

$$x_j = \frac{-n_j}{\pi_j} + \sqrt{\frac{n_j}{\pi_j}\left(1 + \frac{n_j}{\pi_j}\right)}, \tag{4.3}$$

for $n_j \geq 0$ and for $j = 1, 2$. Straightforward analysis of (4.3) shows that x_j is an increasing function of $\frac{n_j}{\pi_j}$, with $x_j < \frac{1}{2}$, for $j = 1, 2$. Intuitively, producers have an incentive to allocate more time to protection when there are more predators in their sector, and for a given mass of predators, when protection is relatively less effective against predation in that sector.

Step 2. The sector with the larger proportion of predators is the less secure sector, that is, $p_1 < p_2$ if and only if $n_1/N_1 > n_2/N_2$.

To see why, note that the returns to the two occupations in each sector must be equal. Otherwise, each agent in the less profitable occupation would have an incentive to switch occupations. Given N_j, free entry in both activities implies that n_j adjusts to ensure that

$$p_j\left(x_j, n_j\right) f_j\left(1 - x_j\right) = \frac{N_j - n_j}{n_j}\left(1 - p_j\left(x_j, n_j\right)\right) f_j\left(1 - x_j\right), \quad \text{for } j = 1, 2.$$

The left side of the equation is the return to production in sector j and the right side is the return to predation in the same sector. Since both returns are proportional to output per producer in the sector, its level does not play a direct role in the allocation of people across production and predation. This implies that the security of property in sector j is determined by the relative number of producers in the sector, that is,

$$p_j\left(x_j, n_j\right) = 1 - \frac{n_j}{N_j}, \quad \text{for } j = 1, 2. \tag{4.4}$$

A comparison across the two sectors implies that, in equilibrium, $p_1 < p_2$ if and only if $n_1/N_1 > n_2/N_2$. Note that (4.4) provides two equilibrium conditions, in addition to the two conditions in (4.3).

Step 3. The more secure sector has lower output per worker, that is, $f_1(l_1) > f_2(l_2)$ *if and only if* $p_1 < p_2$.

To see why, note that the returns to predation must be equated across the two sectors:

$$\frac{N_1 - n_1}{n_1}(1 - p_1(x_1, n_1)) f_1(1 - x_1) = \frac{N_2 - n_2}{n_2}(1 - p_2(x_2, n_2)) f_2(1 - x_2).$$

This additional equilibrium condition, together with the equality of returns across occupations in each sector, given by (4.4) ensures that the returns to production will also be equated across the two sectors. They also imply that

$$\left(1 - \frac{n_1}{N_1}\right) f_1(1 - x_1) = \left(1 - \frac{n_2}{N_2}\right) f_2(1 - x_2), \tag{4.5}$$

and thus, the equalization of returns to (any) economic activity across sectors implies that, in equilibrium, $f_1(l_1) > f_2(l_2)$ if and only if $n_1/N_1 > n_2/N_2$, which, together with (4.4), implies that $f_1(l_1) > f_2(l_2)$ if and only if $p_1 < p_2$.

Step 4. The less productive sector is the more secure sector, that is, $p_1 < p_2$ *if and only* *if* $A_1 > A_2$.

To see why, note that (4.2) and (4.4) together imply that

$$\frac{n_j}{N_j} = \frac{x_j}{1 - x_j}, \tag{4.6}$$

for $j = 1, 2$. This, together with (4.5), and the fact that $f_j(l_j) = A_j l_j$, imply that

$$\frac{A_1}{A_2} = \frac{1 - 2x_2}{1 - 2x_1}. \tag{4.7}$$

Recalling that an equilibrium requires that $x_j < \frac{1}{2}$, for $j = 1, 2$ (see, e.g., (4.2) and (4.6)), the equilibrium condition (4.7) implies that $x_1 > x_2$, because $A_1 > A_2$, which in turn, using (4.2), implies that $p_1 < p_2$. That is, the less productive sector is the more secure sector. Importantly, this is also the sector that attracts relatively more producers, because it is relatively more secure, not because it is more productive.

To solve for an interior equilibrium, note that (4.6), for $j = 1, 2$, together with the fact that $N_1 + N_2 = 1$, can be used to eliminate N_1 and N_2, and write

$$\left(\frac{1 - x_1}{x_1}\right) n_1 + \left(\frac{1 - x_2}{x_2}\right) n_2 = 1. \tag{4.8}$$

Using (4.3), for $j = 1, 2$, to replace x_1 and x_2 in (4.7) and (4.8), one obtains two equations in n_1 and n_2. Tedious but straightforward analysis of this system of equations confirms that there is at most a unique interior equilibrium. One can also verify that an interior equilibrium exists if and only if $\frac{A_1}{A_2}$ is not too large.[6]In this equilibrium, output per capita (as opposed to output per worker) must be equal in the two sectors.

Consider the equilibrium allocation $\{N_j^*, n_j^*, x_j^*, l_j^*\}$, for $j = 1, 2$. First, suppose that both sectors have the same productivity, that is, $A_1 = A_2$. It is easy to see that the interior equilibrium in which both sectors are active is the unique equilibrium. One can also see that $x_1^* = x_2^*$, from (4.7), and also that $n_1^*/N_1^* = n_2^*/N_2^*$, from (4.6). Then, from (4.4), it must be that $p_1(x_1^*, n_1^*) = p_2(x_2^*, n_2^*)$. Using (4.3), it follows that $n_1^* = \frac{\pi_1}{\pi_2} n_2^*$. Thus, $N_1^* = \frac{\pi_1}{\pi_2} N_2^*$, and since $N_1 + N_2 = 1$, it must be that

$$N_j^* = \frac{\pi_j}{\pi_1 + \pi_2},$$

for $j = 1, 2$. Accordingly, the larger sector is the one where the efficacy of protection is relatively higher. However, this sector also attracts relatively more predators, until the security of property rights is equated across the two sectors.

Now consider the effect of differences in productivity across sectors. One can verify that an increase in the ratio A_1/A_2 will cause a reduction in the security of property in sector 1, while the security of property will increase in sector 2. That is, $p_1(x_1^*, n_1^*)$ is decreasing in A_1/A_2, whereas $p_2(x_2^*, n_2^*)$ is increasing in A_1/A_2. This is so whether $\pi_1 < \pi_2$ or $\pi_1 > \pi_2$.

The previous analysis illustrates how economic incentives can respond quite differently in economies with and without the rule of law. The model offers a formalization of an economy with two sectors that lack perfect and costlessly enforced property rights, and focuses on the equilibrium allocation of talent. In equilibrium, the less productive sector attracts relatively more producers, whereas the more productive sector attracts relatively more predators. In this sense, talent is not only misallocated, but it also "gravitates" towards its least productive (and most secure) uses. An implication of this is that the security of property in the most productive sector falls as the sector becomes relatively more productive. By recognizing that property rights are insecure, the model emphasizes the problem that predators, and not just producers, are drawn to the most profitable opportunities. It also illustrates the importance of understanding the relative returns to productive and unproductive activities as an equilibrium outcome.

Evaluating the impact of alternative government interventions can be significantly complicated by the fact that the returns to economic activity in the formal and the informal sectors are jointly determined. From the above perspective, for instance, a tax on labor income in the formal (more productive) sector would provide an incentive for some agents to switch to the informal sector. However, as the relative proportion of predators in both sectors adjusts, the security of property would tend to improve in the formal sector and it would tend to deteriorate in the informal sector. On the expenditure side, if the tax revenue were used to enhance the relative efficacy of property rights protection in the formal sector (π_1), this would tend to increase the security of property in both sectors. Instead, if tax revenue were invested in infrastructure in the formal sector so as to raise the value of A_1, the return to formality would tend to rise, providing an incentive for some informals to switch to the formal sector. However, in response to this, the security of property in the formal sector would tend to deteriorate, whereas property rights in the informal sector would tend to become more secure. More generally, the effects of a given policy on the security of property, economic activity, and tax revenue, cannot be understood without respect to how the equilibrium returns to formality and informality will adjust to policy.[7]

4.2 Neoclassical growth theory with insecure property rights

The previous analysis highlights the inextricable link between the creation of effective property rights and the creation of wealth in societies with insecure property rights, and illustrates a general economic approach to the analysis of property rights, conflict and macroeconomic outcomes. In this section I incorporate the previous economic theory of conflict into the

Neoclassical theory of economic growth. Given the centrality of (perfect) property rights in the latter, it is important to understand whether or not departures from perfectly and costlessly enforceable property rights can change significantly the way we understand economic growth.

My analysis in this section follows Gonzalez (2007), and it sheds light on the relationship between the security of property rights, economic growth and economic efficiency. The analysis shows why it is simplistic to presume, even in the absence of equity considerations, that relatively more secure property rights are necessarily more efficient institutional arrangements. Sturzenegger and Tommasi (1994) and Grossman and Kim (1996) present more elaborate models that include equity considerations.[8]

Consider a version of the static model in Section 3.1 that allows for capital accumulation and sustained economic growth. Suppose that individuals are forward looking and seek to maximize the discounted sum of utilities from their consumption stream,

$$U_i = \sum_{t=0}^{\infty} \beta^t \log \left(c_i \left(t\right)\right), \tag{4.9}$$

where $c_i(t)$ is agent i's consumption at date $t \geq 0$. Every period t agent i can produce $Ak_i(t)$ ($A > 0$) units of output using an amount $k_i(t) \geq 0$ of resources. Agent i's output becomes available the following period. However, his claims over next-period output are insecure. Instead, initial claims must be converted into effective property rights. Agent i can influence this process by allocating resources to appropriative activities. Specifically, agent i may allocate an amount $x_i(t) \geq 0$ of resources to the defense of his own claims to property against all other agents and an amount $z_i(t) \geq 0$ to the challenge of the claims of others.

To formalize the consequences of decentralized conflict over economic distribution as simply as possible I suppose that each agent competes against the economy's average, as in Section 3.1. Agent i appropriates the share $p(x_i(t), z(t))$ of his date-t output $Ak_i(t)$ and the share $1 - p(x(t), z_i(t))$ of the average output $Ak(t)$, where $x(t)$ and $z(t)$ are the economy-wide averages of each type of appropriative activity, respectively, and

$$p(x_i(t), z(t)) = \frac{\pi x_i(t)^m}{\pi x_i(t)^m + z(t)^m}, \text{ and } p(x(t), z_i(t)) = \frac{\pi x(t)^m}{\pi x(t)^m + z_i(t)^m}, \tag{4.10}$$

whenever $x(t) + z(t) > 0$, with $\pi \geq 1$ and $0 < m \leq 1$, and $p(0,0) = p_0 \in [0,1]$. At date 0 each agent is endowed with $Ak(0) > 0$ secured resources. Subsequently, agent i allocates his secured resources $y_i(t)$ across consumption and investment activities, facing the resources constraint

$$y_i(t) = c_i(t) + k_i(t+1) + x_i(t+1) + z_i(t+1), \tag{4.11}$$

for all $t \geq 0$, where $y_i(t) \equiv p(x_i(t), z(t)) Ak_i(t) + (1 - p(x(t), z_i(t))) Ak(t)$, and where I have assumed for simplicity that all capital stocks depreciate fully every period.

I shall restrict attention to *symmetric* equilibria and focus directly on equilibrium behavior. An individual allocation $\{c_i(t), k_i(t+1), x_i(t+1), z_i(t+1)\}_{t=0}^{\infty}$ and an average allocation $\{c(t), k(t+1), x(t+1), z(t+1)\}_{t=0}^{\infty}$ constitute an equilibrium if the individual allocation maximizes (4.9) subject to (4.11), and the individual allocation and the average allocation are identical. The assumption that $\frac{\beta\pi A}{\pi+1} > 1$ ensures positive growth.

Intuitively, symmetric equilibrium allocations must be interior. As in the static model in Section 3.1, the marginal returns to all investment activities must be equal in equilibrium:

$$\frac{\partial y_i(t+1)}{\partial k_i(t+1)} = \frac{\partial y_i(t+1)}{\partial x_i(t+1)} = \frac{\partial y_i(t+1)}{\partial z_i(t+1)},$$

for all $t \geq 0$. Replicating the analysis of the static model in Section 3.1, one can verify that this equality of returns alone implies that the security of property is determined as

$$p(x_i(t), z(t)) = 1 - p(x(t), z_i(t)) = \frac{\pi}{\pi+1},$$

for all i, with

$$x(t) = z(t) = \left(\frac{m}{\pi + 1}\right) k(t), \tag{4.12}$$

for all $t > 0$. Symmetric equilibria have the property that the security of property is determined solely by the property rights parameter π. In turn, the term $\frac{m}{\pi+1}$ determines the returns to appropriation *relative* to production. The result that $x(t) = z(t)$ relies upon the homogeneity and the symmetry of the conflict technology, the symmetry of the interior equilibrium, and the fact that $x(t)$ and $z(t)$ depreciate at the same rate, as in the model in Section 3.1. This ensures that the incentives to engage in the defense and the challenge of claims respond symmetrically to changes in the parameters of the model and it thus simplifies the analysis, without obscuring the intuition behind the main results.

In addition to the above intratemporal optimality conditions, individuals will trade off current and future consumption so consumption growth satisfies the usual intertemporal optimality condition

$$\frac{c_i(t+1)}{c_i(t)} = \beta p(x_i(t+1), z(t+1)) A,$$

which equates the marginal rate of substitution between current and future consumption,

$\frac{c_i(t+1)}{\beta c_i(t)}$, and the marginal rate of transformation, $p\left(x_i\left(t+1\right), z\left(t+1\right)\right) A = \frac{\pi A}{\pi+1}$.

Gonzalez (2007) shows that the symmetric equilibrium satisfies

$$x\left(t+1\right) = z\left(t+1\right) = \left(\frac{m}{\pi+1}\right) k\left(t+1\right) = \left(\frac{m}{\pi+1}\right)\left(\frac{\beta\pi}{\pi+1}\right) Ak\left(t\right),$$

$$c\left(t\right) = \left[1 - \left(1 + \frac{2m}{\pi+1}\right)\left(\frac{\beta\pi}{\pi+1}\right)\right] Ak\left(t\right),$$

for all $t \geq 0$. A symmetric equilibrium exists whenever the term in brackets is positive. It exhibits inefficiently low investment and growth, because agents internalize the fact that a fraction $\frac{1}{\pi+1}$ of each agent's own output accrues to others. However, agents do not internalize the fact that the social cost of future consumption in terms of current consumption is $1+\frac{2m}{\pi+1}$. This *conflict externality* has remarkable welfare implications. To see why, first note that the entire equilibrium consumption path of each individual can be described by the level of initial consumption

$$c\left(0\right) = \left[1 - \left(1 + \frac{2m}{\pi+1}\right)\left(\frac{\beta\pi}{\pi+1}\right)\right] Ak\left(0\right),$$

and the constant growth rate of consumption

$$\gamma \equiv \frac{\beta\pi A}{\pi+1} - 1.$$

One can then verify that the agents' identical lifetime utility from their equilibrium consumption stream amounts to

$$U_i = \left(\frac{1}{(1-\beta)}\right)\left[\beta \log(1+\gamma) + (1-\beta)\log c(0)\right],$$

where the agents' resources constraint links initial consumption and growth,

$$c(0) = Ak(0) - \left(1 + \frac{2m}{\pi+1}\right)(1+\gamma)k(0).$$

Consider the relationship between property rights, growth and efficiency. Note that as π approaches infinity, $(c(0), \gamma)$ approaches the no-externality optimum $(c^e(0), \gamma^e) = ((1-\beta)Ak(0), \beta A - 1)$. For a comparison, first suppose that $\pi = \infty$ and consider any (nonoptimal) pair $(\widehat{c}(0), \widehat{\gamma})$ such that $\widehat{c}(0) > c^e(0)$ and $\widehat{\gamma} < \gamma^e$ are linked by the feasibility conditions. Note that if we move towards the optimal growth policy by raising $\widehat{\gamma}$, $\widehat{c}(0)$ falls. With perfect property rights there is no need for concern; welfare necessarily increases, despite the fall in current consumption.

Now start at $\pi = 1$ and consider the effect of improvements in π towards the no-externality optimum. For sufficiently high values of β and m the monotonic utility path in the previous paragraph — starting from a nonoptimal policy — cannot be mimicked.

The route that π takes towards the no-externality optimum creates problems along the way, because conflict rises along a higher-growth path, and the increased misallocation of resources can outweigh the positive effect of growth. Gonzalez (2007) shows that *if* β *and* m *are sufficiently high, there exists a non-empty interval* $(\underline{\pi}, \overline{\pi})$ *such that social welfare* $\sum_{t=0}^{\infty} \beta^t \log(c(t))$ *declines with* π *for* $\pi \in (\underline{\pi}, \overline{\pi})$. To see why write the resources constraint as

$$Ak(t) = \left(1 + \frac{x(t+1) + z(t+1)}{c(t)}\right) c(t) + k(t+1),$$

and note that conflict imposes a tax on consumption at the rate

$$\frac{x(t+1) + z(t+1)}{c(t)} = \frac{\frac{2m}{\pi+1}(1+\gamma)}{A - \left(1 + \frac{2m}{\pi+1}\right)(1+\gamma)}. \tag{4.13}$$

It is immediate that this consumption tax is an increasing function of the growth rate γ, everything else being equal. A sufficient increase in this tax rate as growth increases will cause welfare to fall. However, while γ increases with π (since $\gamma \equiv \frac{\beta\pi A}{\pi+1} - 1$), the opportunity cost of productive activities, as given by $\frac{2m}{\pi+1}$, is a decreasing function of π. The balance of these effects is such that the tax rate given by (4.13) will increase with π whenever π is sufficiently low. Increased conflict then *necessarily* creates a zone of non-monotonicity when the values of m and β are sufficiently high.

Of course, if perfect property rights could be implemented costlessly, everyone in the economy would be better off. Nevertheless the above analysis offers a simple counterexample to the traditional view that relatively more secure property rights are a more efficient institutional arrangement. The underlying mechanism is inherently associated with the very incentives that are necessary for economic growth. In the model, an improvement in the efficacy of defensive activities (or a decline in the efficacy of predatory activities) necessarily translates into more secure property, which in turn encourages capital accumulation and growth. The problem, however, is that the returns to appropriation rise over time as the economy evolves along a higher growth path. The rise in future conflict that comes with growth may then result in a reduction of lifetime utilities for all agents in the economy. This argument illustrates the complexity of the relationship between property rights and economic efficiency. One needs to recognize the central role that incentives, and general-equilibrium effects, play in the relationship between property rights and economic efficiency, because this matters for the way we think about economic backwardness and development, as I shall argue further in Section 5.

4.3 Conflict and innovation

The view that technology adoption influences the distribution of wealth underlies the notion of "social resistance" to technological change, as discussed by Olson (1982) and Mokyr (1990). As formalized by Krusell and Rios-Rull (1996) and Parente and Prescott (1999), the argument is based on the premise that innovation is not a Pareto improvement — there are economic winners and losers — and that economic losers have an incentive to block technology adoption by others. Acemoglu and Robinson (2000) make a sharp distinction between economic and political losers, and argue that it is the effect of innovation on political power that matters. If the only effect of innovation by others is that it erodes the economic rents of those with political power, then they would be willing, and able, to allow for innovation and use their power to redistribute ex post. The anticipation of an erosion of their political power is a reason why powerful interest groups may oppose innovation by others. However, this does not explain why those with political power refuse to adopt superior technologies themselves, or why technology adoption influences the distribution of power in such a perverse manner. The following analysis sheds light on these questions, by focusing on the interaction between innovation and power.

One may interpret the model below as one where potential innovators resort to *ex post* litigation to secure intellectual property rights. The practical relevance of this situation for innovation in developed economies is well illustrated by Jaffe and Lerner (2004). Alternatively, the model formalizes the effect of *ex post* political redistribution on *ex ante* innovation in situations where a fixed number of potential innovators compete for government subsidies, and/or where monopoly rights over markets are made secure through costly political competition. Sturzenegger and Tommasi (1994) explore some of the issues within a model of endogenous, economy-wide growth. Here, for simplicity, I restrict my attention to the strategic problem between two agents in isolation.

In particular, I shall argue why the adoption of inferior technologies can be a strategic response to the anticipation of conflict over economic distribution when property rights over newly created wealth are insecure. My analysis follows Gonzalez (2005), which builds on Skaperdas (1992). As everywhere else in this article, I emphasize the problem of the use of coercive power, political and otherwise, in society, and the link between conflict over economic distribution and the creation of effective property rights. In this section, however, I focus on the consequences of strategic behavior, rather than focusing on the decentralized choices by atomistic individuals.

Consider the following two-period variant of the model in Section 4.2 to allow for strategic interaction between two investors, indexed by $i = 1, 2$. In the first period, each agent

i is endowed with some initial wealth y_i and allocates his initial wealth between current consumption (c_i), productive investment (k_i), and two unproductive investments (x_i and z_i) that are allocated to the protection of property rights and to predation, respectively. Initial wealth y_i is assumed to be secure, and thus, agent i's current consumption is

$$c_i = y_i - k_i - x_i - z_i.$$

In the second period, agent i secures a fraction $p(x_i, z_j)$ of his own output $f_i(k_i)$ and he appropriates a fraction $1 - p(x_j, z_i)$ of agent j's output $f_j(k_j)$, for $i \neq j$. Agents consume all secured income. For simplicity, suppose that all capital stocks depreciate fully after production takes place. Thus, agent i's second-period consumption (c_i') is:

$$c_i' = p(x_i, z_j) f_i(k_i) + (1 - p(x_j, z_i)) f_j(k_j), \quad i \neq j,$$

where

$$p(x_i, z_j) = \frac{x_i^m}{x_i^m + z_j^m}, \quad i \neq j,$$

when $x_i + z_j > 0$, with $0 < m \leq 1$, and where $p(0,0) = p_0 \in [0,1]$. This is just the conflict technology given in (4.10), except that it is assumed that $\pi = 1$, for simplicity.

Suppose that each agent i seeks to maximize the discounted sum of utilities from his consumption stream, given by $u(c_i) + \beta u(c_i')$, where β is the discount factor. For concreteness, one may assume that $u(c_i) = \log(c_i)$ and $f_i(k_i) = A_i (k_i)^{\alpha}$, with $0 < \alpha \leq 1$. Below I formalize the problem of technology adoption as the problem of the non-cooperative choice of A_i by the two agents, but for now suppose that the value of A_i is exogenously given.

To characterize an interior Nash equilibrium, note first that each agent's trade-off between current and future consumption must be optimal, that is,

$$\frac{\partial u(c_i) / \partial c_i}{\beta \partial u(c_i') / \partial c_i'} = p(x_i, z_j) \frac{\partial f_i(k_i)}{\partial k_i},$$

for $i = 1, 2$ with $j \neq i$. This is the familiar Euler equation that characterizes optimal saving, except that the marginal return to productive capital is now a fraction of its marginal product, due to insecure property rights. It equates the marginal rate of substitution between current and future consumption and the corresponding marginal rate of transformation. Note that this condition must hold for agents i and j simultaneously.

Second, optimal behavior requires that agent i allocates resources between investment activities until their marginal returns are equal. Thus the following two intratemporal optimality conditions need to hold.

$$p\left(x_i, z_j\right) \frac{\partial f_i\left(k_i\right)}{\partial k_i} = \frac{\partial p\left(x_i, z_j\right)}{\partial x_i} f_i\left(k_i\right), \tag{4.14}$$

$$\frac{\partial p\left(x_i, z_j\right)}{\partial x_i} f_i\left(k_i\right) = \frac{-\partial p\left(x_j, z_i\right)}{\partial z_i} f_j\left(k_j\right), \tag{4.15}$$

for $i = 1, 2$ with $j \neq i$. Equation (4.14) equates the marginal returns of productive and defensive investments. Equation (4.15) equates the marginal returns of defensive and predatory investments. These two equations hold for both agents simultaneously, with remarkable implications. Tedious but straightforward manipulation of these four equations shows that the agents' interior equilibrium choices k_i^*, x_i^* and z_i^*, must be such that

$$p\left(x_i^*, z_j^*\right) = 1 - p\left(x_j^*, z_i^*\right) = \frac{1}{1 + \left(\frac{\partial f_i\left(k_i^*\right)/\partial k_i}{\partial f_j\left(k_j^*\right)/\partial k_j}\right)^{\frac{m}{1+m}}}, \tag{4.16}$$

for $i = 1, 2$ with $j \neq i$. Thus, the agent with the relatively lower marginal product has more secure property, and furthermore, he appropriates a larger fraction of the other agent's output. This result is a direct implication of the fact that both agents allocate their saving so as to equate the marginal returns across all investment activities. Intuitively, it reflects the fact that the less productive agent has a comparative disadvantage in production, and a comparative advantage in protecting his own property as well as in appropriating the property of the other agent, because being less productive at the margin lowers the opportunity cost of both appropriative activities.

The reason why $p\left(x_i^*, z_j^*\right) = 1 - p\left(x_j^*, z_i^*\right)$ is that protection and predation have been assumed to be equally effective in the conflict technology, that is, $\pi = 1$. Accordingly, in equilibrium each agent i appropriates a fraction $p\left(x_i^*, z_j^*\right)$ of the total output $f_1(k_1) + f_2(k_2)$, and thus, the problem is isomorphic to the familiar problem of conflict by appropriation from a common pool. In this case, each agent i's share of output, $p\left(x_i^*, z_j^*\right)$, is a natural measure of the agent's power. Then, (4.16) implies that each agent's power is related to the productivity differential between agents so that a relative productivity advantage is associated with a comparative disadvantage in appropriation. This remarkable result is due to Skaperdas (1992).

Furthermore, it is not difficult to verify that the interior equilibrium must be such that $\frac{\partial f_1(k_1)}{\partial k_1} > \frac{\partial f_2(k_2)}{\partial k_2}$ if and only if $c_1 < c_2$ and $c_1' < c_2'$. That is, in equilibrium, the agent with the highest marginal product will not only have less secure property, and less power, but also he will consume less in each of the two periods.

Is there a non-trivial equilibrium distribution of output, and if so, what determines the productivity differential between the agents? It is important to note that the answer to these questions depends on the precise determinants of productivities. For instance, the analysis so far carries through when $f_i(k_i) = A_i(k_i)^{\alpha}$, with $0 < \alpha \leq 1$. If in addition we assume that $A_1 = A_2$, and $\alpha < 1$, diminishing returns to capital in production imply that, in equilibrium, the agent who allocates relatively more capital to production is relatively less productive at the margin, and so he has more secure property rights, and more power, and he will enjoy higher consumption in both periods. However, whether or not $k_1 \neq k_2$ is an equilibrium outcome, and the extent of the difference, depend on the underlying environment, for example, on the presence of asymmetries in the initial endowments of wealth. Thus, diminishing returns in production provide one channel through which wealthier agents may have an advantage over poorer agents.

Alternatively, suppose that the production function exhibits constant returns to scale, that is, $\alpha = 1$ and therefore

$$f_i(k_i) = A_i k_i.$$

In this case, equation (4.16) becomes

$$p\left(x_i^*, z_j^*\right) = 1 - p\left(x_j^*, z_i^*\right) = \frac{1}{1 + \left(\frac{A_i}{A_j}\right)^{\frac{m}{1+m}}},$$

for $i = 1, 2$ with $j \neq i$. Note that the most productive agent may or may not be the agent with the highest initial wealth. It is marginal productivity that matters, not initial wealth.

The previous argument suggests that technology adoption has strategic value when property rights are insecure. This possibility can be analyzed by considering an extension of the previous model to allow for a prior stage. In the first stage, each agent i chooses to adopt a technology A_i among those in the interval $[A_l, A_h]$, with $0 < A_l < A_h$. Suppose, furthermore, that all technologies are readily available at zero cost. In the second stage, agents play the above two-period game, with $f_i(k_i) = A_i k_i$.

The details of the analysis of this problem are found in Gonzalez (2005). I show, for instance, that both agents will adopt the worst available technology if diminishing returns in the conflict technology are sufficiently weak, e.g., $m = 1$. The problem arises because the production technology is committed *ex ante*, whereas the more productive agent *ex post* has a comparative disadvantage in the creation of property rights (in protection as well as predation). Anticipating this, each agent attempts to gain a comparative advantage in predation *ex post* by choosing a relatively inferior technology, which in equilibrium results in both agents choosing A_l. This result illustrates sharply the potential severity of the hold-up problems that arise when private property is insecure, by showing how the anticipation of conflict over economic distribution can give rise to technological backwardness, even though superior technologies are readily available at zero cost.

In the previous example, both agents adopt the least productive technology, and so they have symmetric power. However, if there are stronger diminishing returns in the conflict technology, that is, if $0 < m < 1$, there will be other possible equilibria, with a non-degenerate distribution of power. Moreover, as m falls towards 0, the equilibrium choices of technology will remain inefficient, even though the level of predatory activities becomes negligible. This illustrates the fact that inefficient innovation may arise even though the direct costs of actual predatory behavior are negligible. Consequently, trying to measure the effect of conflict by focusing on measuring observable conflict can be misleading. In particular, assuming that the lack of observable conflict means that the threat of conflict is also absent would miss the fact that *poverty is the price of peace.* Finally, Gonzalez (2005) shows that the main results extend to the case where $\pi > 1$ in the conflict technology, provided that π is not too high. In this sense, it is the insecurity of property that is inimical to technology adoption.

5 Escaping economic backwardness: pitfalls and opportunities

> [W]henever man is faced with new problems, his first reaction is still to bring about the required adjustment by the crude method of force rather than by

operating through the spontaneous interplay of individuals. [Hayek, 1955, p.32]

Like Olson (1996), my reading of the empirical evidence is that economic backwardness must involve enormous gains from trade left on the table. Yet, it is simplistic to conclude that it is solely "market failures" that underlie this inefficiency, or that they can be easily corrected simply because there exist more efficient allocations. Similarly, it is simplistic to conclude that it is solely "political failures" that underlie the problem, or that those can be easily corrected simply because there exist more efficient political outcomes. Recognizing this, scholars are increasingly calling for a radical departure from the traditional markets-versus-governments hypothetical dichotomy towards the view that markets and governments are inextricably linked and their link plays a key role in the process of development.[9]In this spirit, the rest of this article reconsiders the dispersed use of coercion in the presence of government.

5.1 Growth versus efficiency

Traditional pro-growth macroeconomic policies cannot be defended on the grounds of efficiency independently of the institutional environment. Such a defense is far from compelling even if one disregards the fact that there usually are winners and losers from specific economic policies. The problem is that achieving an efficient allocation of resources, conditional on a weak institutional environment, may in fact require a sacrifice of economic growth in exchange for a reduction in conflict. To see why, consider an extension of the model in Section 4.2 to include a policy maker. The details of the analysis are found in Gonzalez and Neary (2008). Here I will sketch the main argument.

To make things as stark as possible, suppose that the policy maker is benevolent, that is, she seeks to maximize the sum of utilities of the private agents. Further, suppose that the policy maker has access to a system of taxes, cannot discriminate between agents, and must balance the government budget period by period. Of course, if access to tax instruments were unrestricted, the policy maker would implement the unconstrained efficient allocation, in which there would be no diversion of resources, property rights would be perfectly secure and growth would increase to the efficient level. However, this theoretical result amounts to asserting that a benevolent policy maker with the power to enforce property rights can solve the problem. This just takes us back to a simplistic central-enforcer view of the world. To see the kind of problems that arise with this view, suppose that the system of taxes and subsidies consists of an income tax at the rate τ (positive or negative) and a lump-sum tax t on each private agent. Thus, the policy maker can use the distortionary income tax or subsidy to manipulate the growth rate of the economy, and the non-distortionary tax to balance the budget, but it cannot target directly the agents' diversionary investments.

Consequently, it is easy to verify that the equalization of marginal returns to all types of investment activities implies that private agents will choose

$$x(t) = z(t) = \left(\frac{m}{\pi + 1}\right) k(t), \tag{5.1}$$

just as they would in the absence of any fiscal policy (that is, as in (4.12) above). Therefore, it will also be the case, as before, that the equilibrium security of property is given by

$$p(x_i(t), z(t)) = 1 - p(x(t), z_i(t)) = \frac{\pi}{\pi + 1}, \tag{5.2}$$

for all i, independently of the tax policy. Note, moreover, that the equilibrium growth rate is a function of the tax rate τ:

$$\gamma^*(\tau) = (1 - \tau)\frac{\pi \beta A}{\pi + 1} - 1. \tag{5.3}$$

In this context, the optimal policy will achieve a symmetric allocation such that the utility of the private agents is maximized subject to the constraints (5.1) and (5.2). In turn, this is isomorphic to a planning problem where productive capital and consumption are allocated symmetrically across agents so as to maximize their utility subject to the resources constraint

$$Ak\left(t\right) = c\left(t\right) + \left(1 + \frac{2m}{\pi + 1}\right) k\left(t + 1\right).$$

The only difference between this problem and the first-best problem is that here the relative price of capital, in terms of consumption is in effect given by $1 + \frac{2m}{\pi+1}$, rather than 1. This simply takes into account that for every additional unit of productive capital, private agents allocate $\frac{2m}{\pi+1}$ additional units to diversionary investments. Thus, intuitively, the constrained efficient allocation will exhibit a growth rate equal to

$$\gamma = \frac{\beta A}{1 + \frac{2m}{\pi+1}} - 1.$$

Moreover, this solution can be implemented by an income tax (positive or negative) at the rate τ^* such that

$$\frac{1}{1 + \frac{2m}{\pi+1}} = \left(1 - \tau^*\right) \frac{\pi}{\pi + 1}, \tag{5.4}$$

together with a lump-sum tax equal to

$$t^* = -\tau^* Ak\left(t\right).$$

Comparing (5.3) and (5.4), one can see that the optimal distortionary tax τ^* is simply the tax (or subsidy, if τ^* is negative) that would provide incentives for the private agents to invest in a socially desirable manner. The lump-sum tax t^* is simply the tax that is needed to balance the budget.

Inspection of equation (5.4) shows that the optimal growth policy has the property that $\tau^* > 0$ if and only if $\frac{\pi}{\pi+1} > 1/(2m)$. For instance, if $m = 1$ we have that the optimal growth policy is to tax, rather than subsidize, growth, for all $\pi \geq 1$, with $\pi < \infty$. Moreover, this is so even though economic growth is in fact inefficiently low in the *laissez-faire* equilibrium, relative to the first-best allocation. Of course, this argument does not imply that growth is bad. Rather, it illustrates that a reduction in economic growth may be necessary in order to mitigate the problem of diversion that is associated with the private enforcement of property rights, *conditional on the institutional environment.* Instead, economies with a relatively higher efficacy of protection relative to predation, can afford to promote relatively more growth without inducing too much additional conflict.

The main objective of the previous analysis has been to show that different theories about the relationship between insecure property rights, conflict and growth can lead to radically different views about which policies are desirable. Importantly, I have taken as given that “desirable” means Pareto efficient, not because I think equity considerations are unimportant, but because I think that economists and policy makers who favor the promotion of economic growth above all else, and who have had enormous influence on development policy in the past, have tended to equate growth and efficiency. It is thus important to recognize that while the objective of growth can be justified on efficiency grounds within traditional Neoclassical growth theory, this is no longer the case once general-equilibrium interactions between insecure property rights, conflict and growth are taken into account. Of course, whether particular economic policies are feasible or not also depends on the specific institutional environment. For instance, countries where property rights are insecure are precisely those where the government's capacity to raise tax revenue is likely to be severely constrained (see Section 5.2.3 below).

The foregoing analysis suggests that the problem of development cannot be conveniently decomposed into conflict management and prosperity as independent goals that can be achieved independently. From this perspective, the development dilemma is how to achieve one without sacrificing the other. Surely, individuals have a strong incentive to come up with governance mechanisms. What the above analysis suggests is that economic backwardness is the means by which to mitigate the conflict that governance leaves unaddressed. My conclusion is that the study of development is the study of the governance mechanisms that can support prosperity without conflict, much in the spirit of Bates' (2001) approach to the political foundations of economic development.

5.2 Coordinating coordination failure

If secure property rights are so critical to economic development, why are they so rare? One answer to this question is that society must solve a *massive coordination problem* if secure property rights are to emerge "from within". Since Rosenstein-Rodan (1943), economists have thought of economic backwardness as a massive coordination failure. A precise notion of coordination failure arises naturally in the context of equilibrium models in which interactions among individuals are dominated by *complementarities* — the property that marginal returns accruing to agents from undertaking some activity rise when other agents undertake similar activities. In particular, models with complementarities may exhibit multiple Pareto-ranked equilibria, formalizing the notion that an economy may be "trapped" in an inefficient equilibrium. Even though all agents understand that this is the case, they fail to coordinate their behavior to reach an equilibrium outcome that is strictly preferred by everyone.[10]In this context, the view of government as a coordinator arises naturally. In this section, however, I argue that this view is far from compelling when applied to the security of property rights, because government itself is an integral part of the problem.

5.2.1 Conflict traps

Consider how coordination failure may arise in the context of the model of occupational choice that was analyzed in Section 3.2. The new assumption is that the efficacy of protection relative to predation, as given by the parameter π in the conflict technology, is now a decreasing function of the proportion of predators in the economy, $\pi(n)$, and individuals take $\pi(n)$ as given when making their decisions. The analysis is exactly the same as before, except that now one needs to account for the effect of a new externality, working through π only. Suppose for simplicity that $m = 1$. Equation (3.13) continues to apply, so any proportion of predators n that solves

$$\frac{1}{n} - n = \pi(n)$$

is an equilibrium outcome. As before, the left side is a decreasing function of n. Now, in addition, π responds to n by falling as n rises. Hence, if n rises for some reason, then π will fall, and that in turn will induce a further increase in n. This mechanism can lead to multiple equilibria. For the specific example

$$\pi(n) = 1 + \frac{1}{3}\left(\frac{1-n}{n}\right)^2,$$

there are three different equilibria, with (x^*, n^*) equal to $(0, 0)$, $(0.21, 0.27)$ and $(0.35, 0.56)$, respectively. In particular, there is a stable equilibrium in which a relatively high proportion of people choose to be predators, rather than producers, and so effective property rights are relatively low, which makes predation attractive. Other externalities will have similar effects. The general mechanism is that an increase in the proportion of predators lowers the relative returns to production (Murphy et al., 1993, Acemoglu, 1995).

A key feature of the previous example is that the equilibrium allocation may exhibit low levels of production (a "poverty trap") and high levels of conflict (a "conflict trap") even though there is another equilibrium allocation that is strictly preferred by every producer and every predator. Like the models in the previous sections, the present model implies that the fact that insecure property rights and economic backwardness are socially inefficient does not automatically translate into rule of law and prosperity. However, the existence of multiple Pareto-ranked equilibria illustrates an additional role that the coordination of expectations may play, where coordination failure arises from self-fulfilling pessimistic expectations.

Importantly, it would be misleading to interpret the above result as implying that prosperity is simply a by-product of the security of property rights, or vice versa, as a plain comparison across equilibria may suggest. Rather, the multiplicity of Pareto-ranked equilibria underscores the deep complementarity between prosperity and the security of property rights, and the corresponding difficulty associated with the fact that the two outcomes can only be achieved simultaneously.

5.2.2 Government as coordinator

From the perspective of the problem of development as a massive coordination failure, there is a role for government as a coordinator. In particular, in the spirit of Hobbes (1991 [1651]) and Weber (1978 [1922]), government can, in principle, be the third party that might solve the effective insecurity of property rights that tends to afflict less-developed and transition economies. However, this view runs quickly into problems. Surely, an omnipotent state can correct all market and political failures. However, actual governments are neither omnipotent nor intrinsically benevolent. Even if one adopts the view that governments in developed countries in effect act much as if they were benevolent central-enforcers, this is the very fact to be explained, rather than assumed. Furthermore, the logic of the process of development must be consistent with the starting point, which involves insecure property rights and private enforcement of property rights, and where, contrary to traditional economic views, the state lacks exclusive control over the use of coercion.

5.2.3 Policy as a source of multiple equilibria

Viewing government as less-than-omnipotent coordinator introduces the possibility that government itself becomes part of the problem. One immediate problem is that policies themselves can be part of the problem. Zak (2002), Roland and Verdier (2003) and Gradstein (2004) have argued that this problem is particularly relevant with respect to the enforcement of property rights. To see why, re-consider the above example, but now suppose that the effect on π comes from fiscal policy. A tax is levied on individual producers as a proportion $\tau > 0$ of their labor income, and so government revenue in a symmetric equilibrium is given by $T = (1-n)\,\tau p\,(x,n)\,f\,(1-x)$, where the tax rate τ is exogenously given, for simplicity. Suppose that all revenue is used to improve the security of property rights, according to some increasing function $\pi\,(T)$. Suppose that agents take T as given when making their decisions. It is easy to see how the underlying "fiscal" externality can support multiple equilibria. In particular, $\pi\,(T)$ may be low simply because the government cannot raise sufficient revenue. The reason for this is that national income is low, which in turn is due to the fact that $\pi\,(T)$ is low, with a corresponding insecurity of property.

5.2.4 Interactions between economic decisions and political demands

Hoff and Stiglitz (2004) argue that weak political demand for secure property rights is a key source of the wide difference between the actual consequences of the mass privatization of state enterprises in transition economies in the 1990s and what the reformers intended. Their explanation relies on the link between the economic decisions of asset owners and their political demands. For example, since more secure property rights constrain the individuals' ability to strip the assets they control, asset stripping decisions undermine the demand for secure property rights, which can make widespread asset stripping self-fulfilling. The general mechanism relies on the interdependence of private economic decisions, including the creation of effective property rights, and political demands.

To see how the mechanism works, consider once more the simple occupational choice problem by atomistic individuals that was analyzed in Section 3.2. Recall that, in equilibrium, a proportion $1 - n^* (\pi)$ of individuals choose to produce each $l^* (\pi)$ units of output, where $n^* (\pi)$ and $l^* (\pi)$ are given by (3.13) as a function of the efficacy of protection relative to predation (π). Note that $n^* (\pi)$ falls with π, whereas $l^* (\pi)$ rises with π. When π is higher, the returns to production relative to predation rise, more individuals become producers and allocate more of their time to production rather than protection, and the security of their property improves. Also recall that the returns to production and predation are equated in equilibrium, and note that those returns $\left(\frac{1-n^*(\pi)}{1+n^*(\pi)}\right)$ are higher when π is higher. That is, both producers and predators are strictly better off when property rights are more secure (because of higher π).

Now suppose that there is a collective mechanism in place according to which the political demands of the majority of individuals are met. In particular, suppose that individuals "vote" over two alternative institutions of property rights. For simplicity, suppose that the vote is between $\pi_L > 0$ and $\pi_H > \pi_L$. Clearly, if individuals were to vote *before* their economic decisions are made, assuming that they vote according to their preferences, they would all vote for π_H.

However, suppose that the vote takes place *after* economic decisions are made. The problem now is that the preferences of producers and predators are different. Once resources have been committed to production and protection, the share of output that producers can secure for themselves is higher when protection of their property rights is relatively more effective, that is, when π is higher. Conversely, once the proportion of predators is given, the share of total production that the predators appropriate is lower when π is higher, and so the average return to predation is higher when π is lower. Thus, after economic decisions are made, all producers would vote for π_H and all predators would vote for π_L.

Suppose that property rights are improved whenever the fraction of individuals that support the improvement exceeds some number $N \geq 1/2$. It is easy to see that there are two equilibria whenever $n^*(\pi_H) < 1 - N \leq N < n^*(\pi_L)$. To see why, suppose individuals anticipate that $\pi = \pi_L$. Then, the fraction of predators is given by $n^*(\pi_L)$ and so there is insufficient political demand for an improvement in the security of property rights. Similarly, if individuals anticipate that $\pi = \pi_H$, the fraction of predators is given by $n^*(\pi_H)$ and there is enough support to make property rights more secure.

5.2.5 Opportunistic government

The use of coercion by government itself may threaten the security of property rights, in which case government itself may become inimical to development. What determines the behavior of the state *vis-à-vis* the creation of effective property rights? There is hardly space here to open this Pandora's box. Nevertheless, how one answers this question influences heavily how one thinks about the relationship between insecure property rights, economic backwardness and development, and so I conclude this section with a discussion of some of the difficulties involved.

The following model is simple in many ways, but it illustrates a number of important issues. The model refers to the interaction between a unit mass of atomistic individuals and a single opportunistic ruler with the coercive power to violate the property rights of private agents. Importantly, however, the ruler does not have an exclusive monopoly over the use of coercion. Decisions are made in three stages as follows:

Stage 1. Each private agent i allocates one unit of time among production (l_i), protection (x_i) and predation (z_i) and produces $f(l_i) = l_i$ units of output.

Stage 2. For simplicity, the ruler's behavior is modeled in terms of how he allocates tax revenue with respect to the protection of property rights. Suppose that the ruler chooses whether to set $\pi = \pi_L$ at no cost or to incur a fixed cost $g > 0$ in order to set $\pi = \pi_H > \pi_L$. Given the value of π, the distribution of output among agents is as in the basic model analyzed in Section 3.1, where π measures, as usual, the efficacy of private protection versus predation. But now agents are also taxed by the ruler at the rate $t \in (0, 1)$ on their secure income. Thus, agent i's payoff is given by $(1-t)(p(x_i, z) l_i + (1 - p(x, z_i)) l)$, where the function p is given by (3.3), total tax revenue is simply tl, and the ruler consumes tl when he chooses $\pi = \pi_L$, and he consumes $tl - g$ when he chooses $\pi = \pi_H$. Note that aggregate and average quantities, $\{l, x, z\}$, coincide, because the mass of private agents is normalized to 1. The tax rate is exogenously given.

Stage 3. Agents "vote" whether or not to depose the ruler, and he is automatically deposed if more than a fraction N of all agents vote to depose him, with $0 < N < 1$. Interpreting "voting to depose the ruler" broadly as a threat to the ruler's survival, N could be less than half, in principle. The ruler incurs a cost $c > g$ if and only if he is deposed.

From the viewpoint of Stage 3, all agents are indifferent between deposing and not deposing the ruler, because they have already made their production, protection and predation decisions, and the property rights regime is in place. The agents' indifference is inessential. For instance, one could assume that voting to depose the ruler — in general, actively opposing the ruler — brings a private benefit if the ruler is in fact deposed, but a private cost if he is not. The relevant feature is that there are multiple Nash equilibria in Stage 3, creating a coordination problem.

Not surprisingly, the model has multiple subgame perfect equilibria. Two of them are characterized as follows. In Stage 1, $\{l_i^*, x_i^*, z_i^*\} = \{l(\pi_L), x(\pi_L), z(\pi_L)\}$, for all i, where

$$l(\pi) = \frac{\pi + 1}{\pi + 1 + 2m}, \text{ and } x(\pi) = z(\pi) = \frac{m}{\pi + 1 + 2m}. \tag{5.5}$$

For all outcomes in Stage 1: the ruler sets $\pi^* = \pi_L$; every agent i chooses $v_i^*(\pi) = v$, where $v_i(\pi)$ denotes agent i's vote when the property rights regime is given by π. This vote is defined for $\pi \in \{\pi_L, \pi_H\}$, where $v \in \{0, 1\}$ and where $v_i(\pi) = 1$ if the vote is to depose the ruler. The only difference between the two equilibria is whether $v = 0$ or $v = 1$. In either case, political demands in Stage 3 are insensitive to the behavior of the ruler ($v(\pi_L) = v(\pi_H) = v$). Anticipating this, the ruler consumes all taxes in Stage 2. This is a best response because tax revenue is already determined and protecting property rights (by setting $\pi = \pi_H$) is costly. Anticipating that the ruler's strategy is $\pi^* = \pi_L$, regardless of the outcome in Stage 1, the agents allocate their time to production, protection and predation exactly as in the model in Section 3.1, and so (5.5) evaluated at $\pi = \pi_L$ constitutes equilibrium behavior in Stage 1.

Now consider two other equilibria in which the agents' voting behavior reacts to the ruler's behavior. They differ, however, in the conditions under which the survival of the ruler is threatened. In one equilibrium, $\{l_i^*, x_i^*, z_i^*\} = \{l(\pi_H), x(\pi_H), z(\pi_H)\}$, for all i, where $\{l(\pi_H), x(\pi_H), z(\pi_H)\}$ is given by (5.5) evaluated at $\pi = \pi_H$; the ruler always protects property rights ($\pi^* = \pi_H$, for all outcomes in Stage 1), and every agent i votes to depose the ruler if and only if he does not protect property rights ($v_i^*(\pi_L) = 1$ and $v_i^*(\pi_H) = 0$). For example, this equilibrium supports perfectly secure property rights if $\pi_H = \infty$, and $t = g$. In the other equilibrium, $\{l_i^*, x_i^*, z_i^*\} = \{l(\pi_L), x(\pi_L), z(\pi_L)\}$, for all i, where $\{l(\pi_L), x(\pi_L), z(\pi_L)\}$ is given by (5.5) evaluated at $\pi = \pi_L$; the ruler never protects property rights ($\pi^* = \pi_L$, for all outcomes in Stage 1), and every agent i votes to depose the ruler if and only if he protects property rights ($v_i^*(\pi_L) = 0$ and $v_i^*(\pi_H) = 1$). The latter equilibrium requires that the survival of the ruler is threatened precisely when he behaves relatively more benevolently.

Of course, the previous model oversimplifies the problem in many dimensions. It abstracts from the role of repression, the fact that not all rulers are the same, even if one focuses narrowly on dictatorship, and the fact that the ruler's survival may be threatened from within the ruling elite (Wintrobe, 1998). It also abstracts from the interplay between the political regime and economic inequality (e.g., Boix, 2003, Acemoglu and Robinson, 2006). However, the above example is instructive in a number of respects. In the spirit of Barzel (2002, ch. 7-8), the main focus of the model is on the need for collective action in constraining a protection specialist. Collective action is simply modeled as simultaneous actions by many individuals, where each individual gains only if many act simultaneously. Thus, it does not refer to the creation of collective action mechanisms, but to the coordination that is necessary to activate existing mechanisms. In the above model one could allow individuals to organize in several large groups that interact strategically without changing the essence of the problem. The key feature is that the ruling elite acts collectively whereas the groups act alone and therefore need to coordinate their actions if they are to constrain the coercive power of the ruling elite (e.g., Weingast, 1997).

The model recognizes that the effective property rights that maximize the returns to a ruler and the ones that maximize economic efficiency may diverge in the presence of transaction costs, in the spirit of North (1981). It also recognizes that the interests of the ruler and those of private agents may be far from diametrically opposed, in the spirit of Olson (1993). In particular, note that the ruler's payoff in the above equilibrium with $\pi^* = \pi_H$ is equal to $tl(\pi_H) - g$, whereas in the equilibria with $\pi^* = \pi_L$, the ruler's payoff is $tl(\pi_L)$ when he survives, and $tl(\pi_L) - c$ in the equilibrium in which he is deposed. Accordingly, it would be in the ruler's best interest to protect the agents' property rights whenever $tl(\pi_H) - g > tl(\pi_L)$, in which case the ruler would indeed choose to do so if he acted *before* the agents' made their economic decisions. However, the timing of the model above reflects the ruler's commitment problem, in which case the ruler's "encompassing interest" in the economy, is insufficient to ensure that he will protect property rights, either against private agents or against himself. Note that, if the ruler could also choose between the tax rates $t = t_L$ and $t = t_H > t_L$, the same four equilibrium outcomes could be supported for each of the tax rates.

The above problems are not restricted to one-time interactions. Thus, unlike shortsighted "roving bandits", Olson's longer-lived "stationary bandits" may have a relatively strong incentive to exploit the long-run gains of committing themselves to limit their predatory behavior in the short run. How strong an incentive, however, depends on how threats to the ruler's survival influence the ruler's ability to commit, as shown by Grossman and Noh (1994). With respect to this, the different equilibria in the model above capture an array of equilibrium interactions between the ruler's behavior and his survival. In the spirit of Grossman and Noh (1994), the ruler's commitment to relatively benevolent behavior requires that the ruler's survival be affected by his behavior, and it also requires that the survival of the ruler is threatened when his behavior is relatively more predatory. In contrast, the model also supports an equilibrium where the ruler's behavior is relatively more predatory because relatively more benevolent behavior would threaten his survival. This case is closer in spirit to Robinson (1997) who considers the case where relatively more benevolent behavior by the ruler (promoting development) harms his survival probability (through its effect on the distribution of political power). However, what determines the effect of relatively more or less predatory behavior by the ruler on his survival? The previous analysis suggests that this effect is not exogenously given, but the very equilibrium outcome that requires explanation. It also suggests that whether the state is conducive to development or inimical to it is not only an equilibrium outcome, but it may be itself part of the massive coordination problem that society faces.

The fact that multiple degrees of security of property rights can be self-enforcing, and that all private agents benefit from more secure property rights, indicates, superficially, that a move to an equilibrium with more secure property rights can be "engineered". As usual, omnipotent government would be able to do it, and benevolent government would be willing to do it. On the contrary, the essence of the actual problem of an economy with insecure property rights is precisely that the creation of effective property rights is an equilibrium outcome. The multiplicity of equilibria simply underscores the massive coordination problem that needs to be solved. One important intuition is that the threats to property rights from private agents and from government are not independent problems, and so they cannot be solved independently. Moreover, it should be recognized that this interdependence arises from the fact that government does not have an exclusive monopoly over the use of coercion. The above argument also highlights a serious limitation of institutional design as an engine of development, by showing why collective action mechanisms alone are insufficient to create the belief that property is secure. Social consensus is also needed. Most importantly, the above argument fails to explain how society can move from one equilibrium to another. Under the perspective of development as a process, rather than an end-result, the view that solving coordination failure can be abruptly achieved by coordinating expectations independently of history is simplistic. One needs to understand how the massive coordination required to escape economic backwardness can take place in real time. As Ray (2007) argues convincingly, coordination itself must be viewed as an equilibrium outcome of some encompassing process, with a specific role for history.

A similar critique applies to the view that repeated interaction solves the problem. On the one hand, it is well understood that cooperation through repeated interaction can help to exploit gains from trade. This can happen when future cooperation is privately valuable to individuals and they can condition future cooperation on current cooperation. The familiar Folk theorem in the theory of repeated games formalizes this mechanism sharply. Bates et al. (2002) offer an interesting analysis of how the use of coercion, by private agents and by the state, can be shaped by cooperation. For them, the ability of groups of individuals to solve potential conflicts internally, without formal rules, is a critical dimension of the problem. On the other hand, according to the Folk Theorem, individuals may or may not cooperate. It depends. In their study of the merchant guild, Greif et al. (1994) also emphasize the role that formal organizations may play in the protection of private property rights against predation by government. Evidently, however, we know very little about the process through which widespread security of property rights can emerge within a large society.

The above model abstracts from detailed political institutions, but one is tempted to interpret equilibria where property rights are better protected, and income per capita is higher, as those that would be supported by relatively more democratic institutions. Indeed, the empirical evidence supports the view that property rights, income and democracy are jointly determined (see, e.g., Acemoglu et al., 2001, and Acemoglu et al., 2008). Several research directions seem promising. Since Olson's (1965) seminal work, it is recognized that group size can play an important role in collective action, but more research on the determinants of group formation and group effectiveness is needed (e.g., Esteban and Ray, 2001). The interplay between various inequalities and institutions — and its implications for development — is receiving increasing attention (e.g., Engerman and Sokoloff, 2002, Chong and Gradstein, 2007), but much remains unclear. A better understanding of these issues, I think, calls for more research on social divisions and conflict (e.g., Montalvo and Reynal-Querol, 2005), and on state building (e.g., Besley and Persson, 2009, Boix, 2010).

6 Conclusion

Why are insecure property rights so inimical to economic development, and why are they so prevalent? To address these questions, I have presented an equilibrium analysis of the structure of incentives, and the macroeconomic outcomes, that we may expect when property rights are insecure. A notion of conflict plays a central role in the analysis; concretely, conflict can be viewed as the equilibrium sum of resources that are dissipated in the process of the creation of effective property rights. Emphasis on the decentralized use of coercion highlights several radical departures from tradition. First, the central problem is the enforcement, and not the allocation, of property rights. Second, in contrast with the Weberian view of the state, government lacks an exclusive monopoly over the use of coercion. Third, focus on private enforcement shifts attention away from the centralized enforcement of legal property rights towards the decentralized creation of effective property rights, via the use of coercion.

In a nutshell, the answer to the first question is that the structure of incentives in an economy with insecure property rights is radically different from that which would prevail under the Neoclassical ideal of perfectly and costlessly secure property rights. Incentives simply cannot be understood without reference to the state of the rule of law. Importantly, insecure property rights are not a mere tax that discourages the creation of wealth. Rather, when property rights are insecure, resources gravitate towards their least productive uses, innovation is held up, more secure property rights are not necessarily more efficient arrangements, and promoting economic growth and promoting economic efficiency may be in conflict. A central lesson is that spontaneous economic order copes with potential conflict by trading off conflict and economic backwardness. An implication is that development requires that society find a way to mitigate conflict without sacrificing prosperity.

However, prosperity without conflict is difficult to achieve. The reason why this is so helps to explain why secure property rights are so rare. Under the conventional view of government as the ultimate enforcer of property rights, the main challenge faced by less developed and transition economies appears to be how to design institutions that ensure that rulers employ their coercive power to enforce, rather than capture the property rights of individuals. One must recognize, however, that the problem of institutional design is significantly complicated by the fact that actual governments lack an exclusive monopoly over the use of coercion. Accordingly, government may lack the necessary resources to protect property rights. Sufficient political demand for secure property rights may be missing, even if the necessary resources are not. Perhaps most importantly, the use of coercion by government and the use of coercion by private agents are inextricably linked. Whether government uses its coercive power to protect or to capture the property rights of individuals is itself an equilibrium outcome, which depends on how individuals respond, both individually and collectively, to the protection and the violation of their rights, respectively. Failure to recognize the deep interdependence of government and markets in general, I think, hinders our understanding of economic backwardness and development. If the approach in this paper has any merit, and indeed the decentralized use of coercion in society is central to economic backwardness and development, a radical departure in the way we think about development is needed.

How society approaches the process of development is of much importance. If the historical record and the lessons from economic theory are any guidance, the clear and present danger is to fall into the trap of presuming that the absence of secure property rights necessarily implies that there is a political demand for secure property rights; that the problem is the mere technical problem of the "supply" of institutions, whatever these may be; that the desired institutional change either involves zero transaction costs, or it can nevertheless be imposed on society through the use of coercion by a central power. This trap results partly from thinking of development as the outcome of a process rather than as the process itself. The former is the traditional view. The latter forces one to cope with the fact that the logic of development must be compatible with the logic of the development problem, not with the end-result of development. A better understanding of insecure property rights, conflict and economic backwardness is necessary because they are the problem to be addressed.

North and Thomas (1973, p. 2) eloquently noted: "the factors we have listed (innovation, economies of scale, education, capital accumulation, etc.) are not the causes of growth; they *are* growth". This, I think, represents the current consensus. However, the consensus view fails to recognize that the rule of law is not the cause of development either; it *is* development.

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1. In this sense, the analysis in this paper is complementary to the general approach to property rights articulated in Barzel (1989).

2. See, for example, Klein et al. (1978) and Williamson (1985).

3. Garfinkel and Skaperdas (2006) discuss alternative specifications of the conflict technology. Konrad (2009) reviews the theory of contests and its applications. Esteban and Ray (1999) present a more general model of conflict.

4. Traditionally, open conflict between rational agents is viewed as the consequence of asymmetric information (Brito and Intriligator, 1985), although this view is coming under increasing criticism (Fearon, 1995, Garfinkel and Skaperdas, 2000, Powell, 2004, 2006).

5. As quoted in Hayek (1955, p. 29).

6. One can also show that there is a corner equilibrium, in which everyone enters the most productive sector, if and only if $\frac{A_1}{A_2}$ is sufficiently large.

7. For instance, when taxing the returns to formality also lowers the returns to informality via the relative market price of informal goods, Marcouiller and Young (1995) argue that increases in the tax rate can even cause the formal sector to expand.

8. Benhabib and Rustichini (1996) and Tornell and Lane (1999) are different, but complementary, approaches to conflict and growth. They focus on common-pool problems where several agents try to redistribute aggregate resources toward themselves. However, conflict

in these models does not use resources. Tornell (1997) formalizes the possibility of changes in property right regimes.

9. See, for example, Usher (1992), Dixit (1996, 2004), Skaperdas (2003), and Greif (2005).

10. Hoff and Stiglitz (2001) and Ray (2007) are excellent discussions of the role of complementarities in development, as is Cooper (1999) in the context of macroeconomics. De Meza and Gould (1992) provide an interesting analysis of the role of complementarities in the context of property rights enforcement.