Coercion and Social Welfare in Public Finance

Economic and Political Perspectives

Edited by

JORGE MARTINEZ-VAZQUEZ

Georgia State University

STANLEY L. WINER

Carleton University

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3

Proprietary Public Finance

On Its Emergence and Evolution Out of Anarchy

Stergios Skaperdas

1. Introduction

Proprietary public finance is a term that, to my knowledge, was first introduced by Grossman and Noh (1994). It refers to the ideal type of a state owned by a single entity – the emperor, the king, the ruler – who maximizes the difference between tax receipts and the costs of running the state. These costs may well include expenditures on public goods because such goods typically enhance production and thus increase tax receipts up to a point. This is a very different type of public finance than the traditional ideal type, whereby taxes and expenditure policies are considered to be welfare maximizing. It is also different from the more pragmatic approaches in which public finance is determined by mixtures of lobbying and parliamentary politics.[1]

Given that the vast majority of states that have existed up to modern times have been autocracies and, at least for many of them, there was no essential distinction between the finances of the state and the finances of its ruler, proprietary public finance has received comparatively little attention. Brennan and Buchanan (1985), while recognizing the historical importance of "Leviathan," concentrate on normative issues on how to constrain "Leviathan." To my knowledge, Engineer (1989) was the first to model the basic choices of a proprietary ruler and contrast them to the case of welfare-maximizing public finance. Findlay (1990) also developed a basic model of a proprietary ruler with reference to the political economy of development, whereas Findlay (1996) presented a spatial model of the extent of empire, of which public finance was a concern. Grossman and Noh (1994)

[1] See Winer and Hettich (2006) for an overview and the exchange in Buchanan and Musgrave (1999). Wintrobe (1998) goes beyond public finance to provide a more comprehensive analysis of autocratic rule (which is not synonymous with proprietary rule).

emphasized the endogeneity of the horizon of a ruler's rule on the ruler's own policies – that is, how a ruler, by overtaxing and underspending on public goods, would likely have a shorter rule because of a higher probability of successful revolt. Therefore, a ruler who is more likely to survive in the long run should be someone who does not tax and spend like there is no tomorrow. Such an insight is probably behind McGuire and Olson's (1996) and Olson's (1993) more celebrated argument that a *stationary bandit* is superior to a *roving bandit*, even though there was no formal argument made in the static model of McGuire and Olson (1996). Moselle and Polak (2001) have explored difficulties in proprietary rule achieving anything close to efficiency, as has Robinson (1997). A distinct rationale for the relative superiority of the stationary bandit to that of Grossman and Noh is found in Myerson (2008), who shows how rulers could do better when there are restraints on their rule, interpreted as constitutional checks on a ruler's power, and how these can emerge as equilibria in dynamic contests for power.

Apart from the analysis of the proprietary state when it is taken as given, there is also the question of why such states have been so common in history and why in many places in the world today autocracies and kleptocracies (which can be approximated by the proprietary ideal type of state) are still rather common. In this paper I argue that proprietary states are likely to emerge out of anarchy as the dominant form of state organization because violence or the threat of violence is the primary means of enforcement in such settings. Unlike the case of a modern state where anyone can buy security services from a firm such as Brinks Security without fearing its personnel for extortion (because Brinks can be sued, and one ultimately relies on the courts and enforcement agencies of a modern state), under anarchy security and protection cannot be bought and sold like other goods and services because the service itself is about the means of enforcement. There is nothing holding back the provider of security in demanding even more than those who originally threatened the purchaser of protection and induced the need for that purchase. If Brinks and its employees did not face the threat of being sued and jailed, there would be nothing other than social norms in holding them back from extorting their clients. Sometimes police officers with low supervision, especially in weak states, as well as Mafiosi do play the dual role or protector and extortionist. There is a reason that the defining characteristic of the state in its common Weberian definitions centers around the near-monopoly in the use of force because without that near-monopoly, contracts on everything else become difficult or impossible to enforce.

I explore the provision of protection systematically, starting from the proverbial state of nature or anarchy and analyzing the industrial organization of protection using a simple model. In doing so I rely on Skaperdas (1992), Konrad and Skaperdas (1998), Skaperdas (2008), and especially Konrad and Skaperdas (2012). Following the logic previously described, in this analysis no contract can be enforced in any other way than the relative ability of adversaries to use force.

Section 2 introduces a very simple model of atomized anarchy and describes how collective protection could improve outcomes over that condition. Collective protection can be employed either by self-governing groups or by for-profit, proprietary rulers. Section 3 analyzes the case of a monopolistic proprietary ruler who provides collective protection to producers in exchange for tribute, the size of which is determined by the relative ability of producer and ruler to use force. Although total output can be higher than output under atomized anarchy, all the extra output is appropriated by the single ruler so that producers could even be worse off than under anarchy. Section 4 examines how different proprietary rulers compete to essentially capture producers within a given territory and behave in other ways just as a single monopolistic ruler does. In the long run, the number or rulers is endogenous, and all the benefits of collective protection are shown to be dissipated in the competition among rulers. It is also argued that self-governing political entities that could provide collective protection in a democratic fashion have difficulties surviving in the presence of proprietary rulers, primarily because of the small size that is needed to control free-rider problems. Thus, competitive proprietary rule (or organized anarchy) appears to be the type of market structure that is the more stable among those examined.

Section 5 explores avenues through which competitive proprietary rule could evolve to become more consolidated and efficient, although still remaining proprietary and perhaps more hierarchical. After discussing the problems with folk-theorem type of arguments, I briefly discuss ways in which the rulers themselves could make investments in elementary forms of commitment devices so as to increase efficiency.

2. Atomized Anarchy and Collective Protection

Consider first a hypothetical simple setting in which individuals are truly atomized so that they have no connection to any other individual and no collective organizations of any kind exist. There are two possible occupations: those of *producer* and *bandit*. Producers have one unit of time that they can devote to two activities: self-protection against bandits (x) and

production $(1 - x)$. Bandits engage full-time in their occupation, which is trying to locate producers and extract from them as much as possible. For simplicity,[2] we suppose that a producer can keep a share x of his output away from bandits, so that his payoff is the following:[3]

$$\pi_p = x(1 - x). \tag{1}$$

The remainder of the production of each producer, $(1 - x)(1 - x) = (1 - x)^2$, is appropriated by bandits. Moreover, the more producers there are relative to bandits, the higher is the payoff of a bandit. Letting P denote the number of producers and B the number of bandits, the payoff of a particular bandit is as follows:

$$\pi_b = (1 - x)^2 \frac{P}{B}. \tag{2}$$

Given the producer's payoff in (1), the optimal choice of self-protection is $1/2$, leaving the remainder $1/2$ for production. Thus, the payoff of a producer is $\pi_p^* = (1/2)(1/2) = 1/4$.

If the payoff of bandits were higher than the payoff of producers, then there would be a tendency of producers becoming bandits. Similarly, if the payoffs of bandits were lower than that of producers, bandits would want to become producers. Therefore, a long-run equilibrium condition for an atomized anarchic economy is that the payoffs of producers and peasants are equalized, or that $\pi_p^* = \pi_b^*$ (which, in this example, equals $1/4$). Given the payoff for bandits in (2), $\pi_p^* = 1/4 = (1/2)^2 \frac{P}{B}$ and the equilibrium condition in our example imply that the number of producers equals the number of bandits ($P^* = B^*$). Letting N denote the total population, the constraint $P^* + B^* = N$ implies $P^* = B^* = N/2$. That is, in long-run equilibrium under atomized autarky we have the following outcomes:

- Payoffs of producers and bandits: $\pi_p^* = \pi_b^* = 1/4$
- Populations of producers and bandits: $P^* = B^* = \frac{1}{2}N$
- Total output: $\frac{1}{4}N$

[2] For more general formulations of this and other parts of the model, see Skaperdas (2008) and Konrad and Skaperdas (2012).

[3] Technologies of protection, violence, and fighting, of course, can get a lot more complicated than that. Hirshleifer (1989) first compared different functional forms, and a sizable literature has emerged on the properties of such functions (see, e.g., Jia 2008; Rai and Sarin 2009; Corchón and Dahm 2010).

Changes in such technologies over the course of history have been critical in creating new types of states and in the "industrial organization of protection." Dudley (1991) has examined the role of such changes in the technologies of fighting in history.

Note that total potential output, under which the whole population would become full-time producers, is N. The long-run equilibrium output, $\frac{1}{4}N$, is lower than that because bandits do not contribute anything to production and producers have to divert some of the resources to defending against bandits. The nature of the technology of self-protection is critical in how many resources are wasted on banditry and self-protection. A more effective technology of self-protection would induce both fewer resources devoted to self-protection and less banditry.

2.1. Collective Protection and Self-Governance

Typically, however, we can expect measures that do not just protect an individual producer but have positive (external or other) effects on other producers to be collectively more effective. Such measures could include warning systems about the presence of bandits in the area, the formation of a militia that becomes active when there is a threat, the building of rudimentary fortifications to protect crops or other property, the employment of full-time guards and police officers, or even the building of villages with an eye toward security.

Consider a group of m producers and suppose that y resources per producer were to be devoted to such a type of *collective* protection. If such protection were to be more effective than individual self-protection, then each individual producer should be able to keep more of his production away from bandits by using this collective protection and committing y to it than by devoting the same resources to self-protection. That is, denoting by $h(\frac{\Sigma y}{m}) = h(y)$ the share of a producer's output that is kept away from bandits when all the members of a group of size m contribute y to collective protection, we expect $h(y) > y$. For simplicity, from now on we suppose that $h(y) = \sqrt{y}$, and for arbitrary contributions of members of the group y_i, we have $h(\frac{\Sigma_{i=1}^m y_i}{m}) = \sqrt{\frac{\Sigma_{i=1}^m y_i}{m}}$.

This collective protection technology could be employed not just by groups of producers contributing their own time and effort but also by entrepreneurs who could hire "guards" to protect peasants from bandits. The two possible methods of employing the collective protection technology – a self-governing group of producers and a specialized entrepreneur who hires guards – might seem equivalent. It could be argued, for example, that, instead of the producers contributing their own time and effort, they could pay the corresponding amount to a group of guards or a security agency that would hire guards to protect the producers against bandits. This, however, assumes that there is already a third party that would be able to enforce a contract between the producers and the security agency,

something that clearly assumes an answer already exists to the protection and security problem that we have sought to examine in the first place. In the absence of third-party enforcement, instead of protecting the producers, a group of guards or a leader who has managed to put together a group of guards under his aegis could conceivably extract even more out of the producers than simple bandits could.

Unless the security agency consists of the rough but moral do-gooders who appear in movies such as *The Seven Samurai* or *The Magnificent Seven*, relying on such organized enforcers to protect a group of producers against bandits does not appear to be a realistic alternative to the producers just banding together and using the collective protection technology themselves. Analyzing how groups of producers who do use the collective protection technology in a self-governing fashion is straightforward (for a detailed analysis, see Konrad and Skaperdas, 2012). Under Nash equilibrium behavior in the contribution of producers to collective protection, there is predictably under-contribution relative to the efficient outcome, and the contribution is lower the larger the group size is. However, the payoff of producers is always higher than the payoff under atomistic anarchy because the more efficient collective protection technology allows the producers both to decrease the resources they devote to protection – thus increasing useful output – and to increase the share they keep away from bandits. With the total population dividing itself into groups of producers and individual bandits, the bandits would also be better off (otherwise, they would not want to become bandits), but there would be fewer of them. That is, the collective protection technology allows an increase in total output for two reasons: both the output of individual producers and the number of producers increases.

Such a state of affairs supposes the absence of large predators, organized bandits, or entrepreneurs who can use the collective protection technology for their own benefit. I will briefly come back to a discussion of the long-run viability of self-governing groups only after analyzing the industrial organization of collective protection in the presence of for-profit, proprietary rule.

3. Monopolistic Proprietary Rule

We consider first a single entrepreneur, a ruler or "Leviathan," who has a monopoly in the provision of collective protection. The ruler hires guards to protect producers from bandits and receives taxes (or tribute) from the producers. His objective is to maximize the difference between taxes and costs.

Even for proprietary rulers, tax rates are typically assumed to be passively set by the ruler (that includes all the related literature cited in the

Introduction, including Grossman and Noh 1994 and McGuire and Olson 1996). The producers react to such rates by optimally setting their productive effort, something that results in deadweight costs of reduced production compared to the cases without taxation and with optimal, welfare-maximizing taxation. Nevertheless, a proprietary ruler who has significant enforcement power in dealing with bandits would also be tempted to use that power against the producers and perhaps exceed the taxation levels that could have been promised. The producers themselves are also less likely to just believe any promised tax rate unless it is close to what the ruler could extract given his potential for violence and will therefore take defensive measures against the ruler in a similar way that they take defensive measures against bandits. The costs that could come from such posturing and the resource misallocation that they bring about would be in addition to those that come just from having a suboptimal tax rate.

Let G denote the number of guards hired by the ruler and continue denoting by P the total number of producers. Then, each producer would receive collective protection against bandits of $h(\frac{G}{P}) = \sqrt{\frac{G}{P}}$. The wage received by guards is the going rate in this economy, which would be the payoff received in the other available occupations of producer and bandit. For given numbers of guards and producers, and self-protection level x by a producer, the maximum share of output that could theoretically be retained by the producer is $x + \sqrt{\frac{G}{P}} (\leq 1)$. Given, however, the ruler's coercive machinery of guards at his disposal, producers could retain only whatever they can keep from being snatched away from them. One possibility is that producers can keep away from the ruler what they keep away from bandits, which is x in the example we have been following. It is possible, however, that the ruler could extract more than simple bandits can – an issue that we will revisit shortly at the end of this section. For now, we suppose that producers can keep away x share of their output away from the ruler.

That is, each producer obtains a payoff of $x(1-x)$, and the ruler obtains from each producer what is kept away from bandits $(x + \sqrt{\frac{G}{P}})(1-x)$ minus what the producers can retain $x(1-x)$ for a net amount of $\sqrt{\frac{G}{P}}(1-x)$ (and a tax rate of $x + \sqrt{\frac{G}{P}} - x = \sqrt{\frac{G}{P}}$). Bandits, if any were to exist, take away $(1 - x - \sqrt{\frac{G}{P}})(1-x)$ from each producer. The net payoff of the ruler is then

$$\sqrt{\frac{G}{P}}(1-x)P - x(1-x)G, \tag{3}$$

where the first term represents the revenues obtained from the producers, and the second term is the cost of hiring the guards. In maximizing this payoff, the ruler needs to take into account several constraints. First, any choice of guards he makes subtracts from the population that is available to become producers and bandits. That is, he needs to take into consideration the following population constraint:

$$N = P + B + G. \tag{4}$$

Second, the choice of guards affects the payoff of bandits, which is the following:

$$\begin{aligned}\pi_b &= \left(1 - x - \sqrt{\frac{G}{P}}\right)(1-x)\frac{P}{B} \quad \text{if } 1 > x + \sqrt{\frac{G}{P}} \\ &= 0 \quad \text{otherwise}\end{aligned} \tag{5}$$

Bandits can receive positive payoff only if there is imperfect security (i.e., $x + \sqrt{\frac{G}{P}} < 1$). If there is perfect security ($x + \sqrt{\frac{G}{P}} = 1$), by definition no bandits exist.

The third constraint that the ruler needs to take into account is that, if any bandits were to exist, they would need to have the same payoff as producers. Given that the payoff of a producer is $x(1-x)$, the optimal choice of x is the same as under atomized anarchy of $1/2$, leading to payoffs for producers, bandits (if any), and guards of $1/4$.

The ruler then maximizes (3) subject to (4), (5), and the conditions that the payoffs of all occupations are equalized. It turns out that the maximizing choice of guards is the one that yields perfect security, so that $x + \sqrt{\frac{G^r}{P^r}} = 1/2 + \sqrt{\frac{G^r}{P^r}} = 1$. That choice along with the other characteristics imply the following outcomes under monopolistic proprietary rule:[4]

- There are no bandits in equilibrium ($B^r = 0$) with $G^r = \frac{1}{5}N$ and $P^r = \frac{4}{5}N$.
- Total output is $\frac{2}{5}N$.
- The ruler obtains a maximal payoff of $\frac{3}{20}N$.
- Producers and guards receive a payoff of $\frac{1}{4}$.

[4] It can be checked that the derivative of the ruler's payoff function evaluated at G^r, the point at which security becomes perfect, is positive, and therefore no level of guards lower than G^r is optimal. Perfect security with no bandits would not necessarily be true under other functional forms for the collective and self-protection technologies. The qualitative features of the equilibrium, however, in terms of comparisons with atomized anarchy are general (see proposition 2 in Konrad and Skaperdas, 2012).

Compared to atomized anarchy, there are a lot more producers under the single ruler, and output is higher. Using the collective protection technology is responsible for all this increase in the number of producers and total output. Nevertheless, all the extra output compared to atomized anarchy $((\frac{2}{5} - \frac{1}{4})N = \frac{3}{20}N)$ is appropriated by the ruler with what was received under anarchy by producers and bandits now going to producers and guards.

3.1. When the Ruler Is Better at Extraction than Bandits

In this analysis of the monopolistic ruler, we have assumed that producers can resist the ruler just as easily as they can resist bandits or, equivalently, that bandits are as good at extraction as the ruler is. What if the ruler were to be better than bandits at extracting ("taxing") the producers' output? Again, for simplicity, we consider an example. In particular, suppose that for any choice of x, producers can keep away from the rulers only $x^2 (< x)$ share of their output. In that case the payoff of producers would be $x^2(1 - x)$. The optimal choice of x would be $x^e = \frac{2}{3}$, the share that could be kept away from the ruler would be $x^{e^2} = \frac{4}{9}$, the output of the producer would be $1 - x^e = \frac{1}{3}$, all resulting in equilibrium payoff of a producer of only $\frac{4}{27}$ (compared to $\frac{1}{4}$ under atomized anarchy or under a ruler who has the same extractive capacity as bandits). Despite the greater effort devoted to self-protection (against the ruler), producers receive a lower share of their output and produce less output.

Whereas the ruler can enjoy a higher tax rate (for any given choice of guards), the output to be taxed is lower. Additionally, however, the hiring of guards is also cheaper because the "going" wage – the equilibrium payoff of producers – is lower. It can be shown that the optimal choice of guards for the ruler in this case is $G^e = \frac{1}{10}N$, which results in perfect security and a number of producers, $P^e = \frac{9}{10}N$. Thus, the ruler hires fewer guards now than when extraction is not as easy and guards are more expensive to hire and there are more producers, and, given that each producer produces less, total output turns out to be lower ($\frac{3}{10}N$ versus $\frac{4}{10}N$, although total output is still higher than under atomized anarchy).

The tax rate is higher ($\frac{5}{9}$), total output is lower, and the total cost of hiring guards can be shown to be lower ($x^{e^2}(1 - x^e)G^e = \frac{4}{270}$). Overall, however, it can be shown that the payoff of the ruler is still marginally higher than when his extractive power is lower. That is, if the ruler could commit to the lower tax rate than he can impose, he would not want to do so.

4. Competitive Proprietary Rule (or Organized Anarchy)

The profits received by the monopolistic ruler can be expected to attract competitors. The type of competition usually examined by economists is one in which different firms (or, adapted for this case, polities) would attempt to attract mobile producers with lower prices (i.e., tax rates) and better provision of the public goods and services they offer. However, the central question that emerges in such an anarchic setting is how the contract between the firms and the producers will be enforced. A ruler could still extract more from producers than promised and provide less collective protection, and there would be no legal recourse on the part of a producer in enforcing a previously agreed on contract. Moreover, the presence of potentially violent competitors who contest a given ruler's territory implies that the ruler might not be even around to honor a contract even if he wanted to do so. That is, the ubiquitous presence of coercion implies a very different type of competition than that of competing security agencies in a modern rule-of-law state.

Suppose there are R rulers. Each ruler controls territory and his relationship to producers within that territory is the same as that of the monopolistic ruler: the collective protection technology is the same, and he hires guards to protect the producers against bandits but also to extract tribute from them. Again, for simplicity, producers are supposed to be able to keep away from rulers the same amount that they alone could keep away from bandits (i.e., the share of output kept by a producer is x).

The major difference from both monopolistic rule and the ordinary modeling of competition, however, is that rulers compete for territory and the producers within them by fighting with one another or by threatening to fight. To do so, they need to develop a military capacity by hiring warriors, where W_i denotes the number of warriors hired by ruler $i = 1, 2, \ldots, R$, with each warrior having the same payoff as producers and guards. In particular, for a given total number of producers, P, the number of producers within ruler i's territory is (assuming $\sum_{j=1}^{R} W_j > 0$)

$$P_i = \frac{W_i^k}{\sum_{j=1}^{R} W_j^k} P \quad \text{for each } i = 1, 2, \ldots, R;\ 0 < k \leq 1. \tag{6}$$

The parameter k represents the effectiveness of conflict, the relative ease with which a ruler can grab more territory at the expense of other rulers.

Letting G_i denote the number of guards hired by i, the payoff of ruler i (provided $\sqrt{\frac{G_i}{P_i}} \leq \frac{1}{2}$) then becomes

$$\sqrt{\frac{G_i}{P_i}}(1-x)P_i - x(1-x)(G_i + W_i),$$

which, given (6) and that producers choose $x = \frac{1}{2}$, becomes

$$\frac{1}{2}\sqrt{\frac{G_i}{\frac{W_i^k}{\sum_{j=1}^{R} W_j^k}P}}\frac{W_i^k}{\sum_{j=1}^{R} W_j^k}P - \frac{1}{4}(G_i + W_i), \quad \text{provided} \quad \sqrt{\frac{G_i}{\frac{W_i^k}{\sum_{j=1}^{R} W_j^k}P}} \leq \frac{1}{2}. \quad (7)$$

Each ruler chooses the number of guards and warriors he hires strategically, so that these choices form a Nash equilibrium. For convenience, and in an analogy with perfect competition in the theory of the firm, each ruler takes the total number of producers as given. The population sorts itself among producers, bandits, guards, and warriors, with individual identity not being essential because all occupations receive the same payoff. All occupational choices and the rulers' strategic choices are made simultaneously and have to be consistent so that they add up to the total population. The equilibrium concept defined next is similar in spirit to notions in general equilibrium in which some players can have some strategic influence on a variable.

Let a *short-run equilibrium* be numbers of peasants ($\hat{P}$), bandits ($\hat{B}$), and foreach ruler ($i = 1, 2, \ldots, R,$) guards ($\hat{G}_i$) and warriors ($\hat{W}_i$) such that

1. each ruler with a payoff function described in (7) takes $\hat{P}$ as given and chooses $\hat{G}_i$ and $\hat{W}_i$ simultaneously with other lords so that these choices form a Nash equilibrium;
2. the payoff of each occupation other than producer should be the same or higher than that of a producer;
3. the number of bandits, $\hat{B}$, equals the sum of the bandits in all of the rulers' territories; and
4. $N = \hat{P} + \hat{B} + \sum_{j=1}^{R} \hat{W}_j + \sum_{j=1}^{R} \hat{G}_j$.

It is theoretically possible for different rulers to choose different numbers of guards and warriors resulting in different security levels (in terms of the total fraction of output that is protected from bandits) across different territories. In our example, however, the equilibrium can be shown to be unique and symmetric and involves – just as in the case of monopolistic

rule – perfect security, so that $\hat{B} = 0$.[5] Moreover, there are analytical solutions to the equilibrium numbers of the other occupations. It is instructive to first see how equilibrium guards and warriors vary with the number of producers as well as the number of rulers themselves (this is obtained by solving for the Nash equilibrium in equilibrium condition 1):

$$\hat{G}_i = \frac{\hat{P}}{4R}$$
$$\hat{W}_i = \frac{k(R-1)\hat{P}}{R^2}. \quad (8)$$

On the one hand, both guards and warriors are increasing in the number of producers: the former are increasing because more guards are needed to guard (and tax) the producers as the number of producers increases, whereas the warriors are increasing in the number of producers because, as there are more producers, there are more rents to be fought over, and the marginal benefit of an extra warrior increases. On the other hand, both guards and warriors are decreasing in the number of rulers. However, the total number of individuals hired as warriors ($R\hat{W}_i = \frac{k(R-1)\hat{P}}{R}$) is increasing in the number of rulers, something that shows that the intensity of this violent competition increases with the number of rulers. Finally, we should mention the role the effectiveness-of-conflict parameter k plays, as warriors are increasing in proportion to the value of that parameter.

By substituting the values at (8) into equilibrium condition 4, we obtain the equilibrium number of producers:

$$\hat{P} = \frac{4R}{M}N,$$

where $M = (5 + 4k)R - 4k$. The number of producers (and, consequently, total output) can be shown to be decreasing in the number of rulers. By substituting for $\hat{P}$ into (8) and multiplying by R, we obtain the total number of guards and warriors:

$$R\hat{G}_i = \frac{R}{M}N$$
$$R\hat{W}_i = \frac{4k(R-1)}{M}N. \quad (9)$$

Whereas the number of guards is decreasing in R (to maintain perfect security guards decrease proportionately to producers), the number of warriors

[5] For general existence and uniqueness results for such an equilibrium, see proposition 3 in Konrad and Skaperdas (2012).

increases as the number of rulers increases, as rulers compete with one another more intensely over a smaller number of producers. (This reduction in producers and increase in warriors as the number of rulers increases is not just a feature of this example but also a characteristic of more general models – see proposition 3 in Konrad and Skaperdas, 2012.)

By substituting all the equilibrium values into the payoff function of a ruler in (7), we obtain the equilibrium payoff:

$$\pi_i(R, k) = \frac{(3 - 4k)R + 4k}{4RM} N. \tag{10}$$

As can be expected, the more rulers are around, the lower the equilibrium payoff of each ruler (i.e., $\frac{\partial \pi_i(R,k)}{\partial R} < 0$) – that is, competition drives down profits. Moreover, it can be shown that profits are decreasing in the effectiveness of the technology of conflict (i.e., $\frac{\partial \pi_i(R,k)}{\partial k} < 0$). The reason for this result is that a higher effectiveness of conflict increases the number of warriors that each ruler hires and thus reduces profits.

Thus far, we have assumed the number of rulers as given. Given that the profit of each ruler is decreasing in the number of rulers, there are obviously numbers of rulers for which profits would be too low or even, possibly, negative. In the long run, in an analogous fashion to the theory of the firm, with free entry and exit we can expect the number of rulers to be endogenous, given a fixed cost of entry into the protection business $F \geq 0$. In particular, we define a *long-run equilibrium* to be a short-run equilibrium (that is, numbers of producers, bandits, guards, and warriors) and a number of rulers, $\hat{R} \geq 2$, such that:[6]

$$\pi_i(\hat{R}, k) \geq F \quad \text{and} \quad \pi_i(\hat{R} + 1, k) < F. \tag{11}$$

Given the properties of $\pi_i(R, k)$, the equilibrium number of rulers is decreasing in the effectiveness of conflict, k. That is, for higher levels of k, when rulers have to hire more warriors for given values of the other parameters, the resultant lower profits imply that fewer rulers can be supported in the long run.

There is a general tendency in a long-run equilibrium for the number of producers to approximate from above the number of producers (and output) under atomized autarky, with a higher entry cost F inducing more production than a lower entry cost. In the limiting case of $F = 0$ and for high enough values of k, the number of producers equals exactly the

[6] If $\pi_i(2, k) < 2$, then the long-run equilibrium involves just one, monopolistic ruler: the case we have examined in the previous section.

number of producers under atomized anarchy ($\frac{1}{2}N$), whereas the number of guards equals $\frac{1}{8}N$ and the number of warriors equals $\frac{3}{8}N$. (When $k = 1$, the number of rulers $\hat{R} = 4$ and for $k = \frac{7}{8}$, we have $\hat{R} = 7$.) That is, all the extra output that could be saved by using the collective protection technology is dissipated in the conflictual competition among rulers. What is appropriated by bandits in atomized anarchy is now used in the employment of guards and warriors, with some bandits possibly surviving on the edges (not in our example, but this can occur more generally).[7] Atomized anarchy is replaced by a different form of anarchy, that of organized, hierarchical entities clustered around multiple, feuding rulers.

The model of this section can be interpreted as either a simple model of interacting sovereign, proprietary states or as a model of profit-seeking warlordism (within a formerly unitary state). Whereas the latter interpretation is the one usually associated with the word *anarchy*, the former is also literally true. After a short excursus on the viability of democratic rule, the last section will explore how rule could become consolidated in the case of warlordism.

4.1. On the Viability of Democratic Rule

In Section 2, I briefly alluded to what would occur if groups of producers were to use the collective protection technology in a self-governing fashion, something we can identify as "democratic" rule. Although there is a free-rider problem that becomes greater with an increasing size of the group, individual welfare is higher than under atomized anarchy, monopolistic rule, or organized anarchy. Therefore, instead of producers acquiescing to proprietary rule, why would such groups not form?

The challenge that such groups would face is that proprietary rulers would attempt to conquer them, just as they do so against one another. The members of the group would need to provide resources not just for internal protection against bandits but also for external defense against proprietary rulers. Even if they were to provide the needed resources for external defense at the group-optimal level, the relatively small size that is needed for the more effective provision of internal protection would not leave much for production. In fact, in examples along those lines (found in section V of Konrad and Skaperdas, 2012) the needed resources for

[7] If rulers could extract taxes from producers more easily than bandits, by the example analyzed under monopolistic proprietary rule, we can expect competitive proprietary rule to be strictly worse than atomized anarchy.

external defense leave very little for production and internal protection, so that internally there are too many bandits relative to both proprietary rule and atomized autarky. No examples have been found in which individual welfare under that type of democratic rule was as high as that under atomized autarky.

That absence of examples in which democratic rule is viable mirrors the historical rarity of that rule. It is, of course, of interest to find examples and characterize the conditions under which democratic rule is viable. Among the conditions that could be explored are the following:

- By introducing different productivities, producers with higher productivities could form their own groups. This feature would allow them sufficient resources for adequate internal and external security, despite their small size. This characteristic would fit the later medieval Italian city-states: they were usually more productive than other polities (primarily as a result of their trading and specialized manufacturing) and also smaller than their more autocratic competitors.
- Less effective technologies of conflict would reduce the cost of external defense enough to allow democratic rule. The early city-states of Sumeria and perhaps (depending on the interpretation) the city-states of classical Greece would fit this feature. (The Greek city-states would also fit the higher productivity case, especially in the initial stages when the combination of olive, vine, and fruit cultivation as well as trade provided an advantage.) The introduction of the Macedonian phalanx and later of the Roman legion can be interpreted as increasing the effectiveness of conflict, thus increasing both the size of proprietary states as well as making democratic rule less viable.

5. Paths to Consolidation

Competitive proprietary rule or organized anarchy involves at least as much waste of resources as atomized anarchy. Instead of just individual bandits forming the main nonproductive block, under organized anarchy, guards, warriors, some bandits, and rulers take their place without offering anything that improves economic efficiency. Societies cannot withstand such conditions for long periods, as life is "nasty, brutish, and short." Empires, kingdoms, even feudalism (for which competitive proprietary rule can be considered a reasonable model) involve less waste and disorder. Mechanisms develop so as to reduce the worst inefficiencies and further consolidate rule, although the benchmarks established by the coercive arrangements

examined thus far have lasting influence on what follows, especially as far as distribution is concerned.

There are two areas in which resources could be saved. First, there is the deep adversarial relationship between ruler and producer, whereby producers reduce production to take defensive measures against the agents of the ruler. Second, rulers could reduce the amount of resources expended on contesting one another's territory and the producers within them. Both types of inefficiencies could be reduced if the *commitment* ability of rulers, with respect to both producers and one another, were to increase.

5.1. The Folk Theorem to the Rescue?

In economics and rational-choice political science, one mechanism of implicit commitment that has been emphasized is long-term relationships, with folk-theorem type of arguments providing game-theoretic underpinnings. Under indefinite repetition of the static interactions I have examined in previous sections, the different agents could initially, in an implicit or explicit agreement, adopt more efficient strategies: the peasants could devote fewer resources to protection and more to production, the rulers might demand less in tribute than they could extract and, simultaneously, hire fewer warriors but keep dividing territory and peasants among themselves as prescribed by the static equilibrium. If one side of a dyadic interaction were to choose to renege on the agreement, then the other side would revert to a punishment strategy that would involve the static inefficient equilibrium for at least a number of periods and possibly indefinitely. Under a sufficiently high discount factor (a "long shadow of the future"), such strategy combinations, and thus more efficient outcomes, can form an equilibrium.

There are, however, a number of issues in considering a folk-theorem argument as a plausible mechanism for alleviating the problems of organized anarchy. First, there is a great multiplicity of equilibria, in terms of levels of efficiency and punishment, and the static, inefficient equilibrium is still an equilibrium in the repeated game. How do the many different sides coordinate on the particular strategy they will follow? Well, simplicity is one criterion, and the simplest, and focal, strategy is the static equilibrium. Moreover, the punishment strategies are typically "non-renegotiation proof" – that is, once someone cheats, he or she could say, "Sorry, I made a mistake and I will not do it again. Could we just go back to the good strategies?" That is, the static, inefficient equilibrium appears to be the most plausible one to follow by all sides.

Second, in our case, both the number of players involved is large and, even more important, there are interactions at multiple levels. How would the producers coordinate among themselves and with the ruler about the amount of resources they will devote to production and protection and the level of tribute their ruler will ask in return? Moreover, if different rulers agree on different levels of tribute and resources with their own producers, then there might be incentives for some rulers to increase the number of warriors they hire so as to take additional territory with more producers and possibly reneging on the agreement the previous ruler of the newly acquired producers. Additionally, with such serious loose ends in the background, the rulers themselves need to coordinate on a lower level of warriors. Therefore, in the case of our model, folk-theorem arguments not only face the problem of coordination among a large number of players but more seriously also involve significant interdependencies across essentially different games in ways that would make even the definition of appropriate punishment strategies difficult and coordination across them even more so.

Third, folk-theorem arguments are made on the basis that the same game will be played period after period. In the conflictual conditions we have examined, however, an equivalence that may exist between conflictual and settling under the threat of conflict in one-period interactions can no longer be assumed in multi-period interactions.[8] In particular, if two rulers were to fight instead of settling on a division of territory, the winner would gain an advantage (more territory) not just in the current period but also, by virtue of his increased fiscal capacity, well into the future. The loser might even be eliminated altogether. This type of non-stationarity makes punishment strategies less likely to exist, and in limiting cases they might not exist at all. Furthermore, higher discount factors in such settings, instead of facilitating cooperation, induce more intense conflict because the winner has more to gain and the loser more to lose (for such models, see Garfinkel and Skaperdas 2000 and McBride and Skaperdas 2010).

Finally, the fourth problem with relying on folk-theorem arguments to explain the emergence of more cooperative types of state rule is that such arguments do not require any institutions, laws, courts, police, and other state infrastructure that is observed in actual states. Solely relying on the folk theorem would seem to imply no need for any organizations whatsoever.

8 In the previous sections we have actually assumed that the rulers never fight it out and they just settle with the shares of producers they receive determined by their relative number of warriors. However, these payoffs would be equal to the expected payoff under overt conflict. In multi-period interactions, this equivalence of payoffs is no longer valid. (See Garfinkel and Skaperdas 2000 or McBride and Skaperdas 2010.)

5.2. Investing in Commitment (or Building a State)

In late medieval Genoa, after decades of internecine warfare the main competing clans made an agreement to bring an external limited enforcer, the *podesta* (Greif, 1998). A new podesta was hired from outside Genoa every year and he performed basic administrative and police duties, but his power was limited so that he could not effectively ally himself with one of the clans against the others. All the clans contributed to the cost of maintaining the podesta, and in return they received some assurance that inter-clan warfare would not take place, and this appears to have worked well for a number of decades. That is, we can think of the clans, through their contributions to hire a podesta, as making investments in (limited) commitment.

Those investments can take other forms as well, from meeting for social and diplomatic purposes with other rulers, to creating a more formal "assembly of rulers," to creating laws, courts, and enforcement agencies. Such measures can contribute to increasing the rulers' abilities to commit to one another that they will not fight or cheat in their dealings with one another, although imperfectly so.[9]

We can model the "degree of commitment" that can be achieved by modifying the sharing function in (6) as follows:[10]

$$P_i = \left[\sigma \frac{1}{R} + (1-\sigma) \frac{W_i^k}{\sum_{j=1}^{R} W_j^k} \right] P \quad \text{where } \sigma \in [0,1]. \qquad (12)$$

The parameter σ represents the degree of commitment (or security). Equation (6) is the special case of (12) for $\sigma = 0$. The polar opposite of that is the case of $\sigma = 1$, whereby commitment is perfect, and the sharing of the producers among the rulers is fixed at $\frac{1}{R}$. The greater σ is, the higher the degree of commitment that the rulers can achieve. The closer 1 is to σ, the closer to the "rule of law for elites" (North, Wallis, and Weingast 2009) or to the state having the monopoly in the means of coercion (Wallis, this volume) we can consider the outcome to be.

9 Ostrom (2010) brings attention to a large number of empirical case studies and experiments in which face-to-face communication as well as other agreements on monitoring and sanctions for cheaters reduce inefficiencies in common-pool settings. Although our setting is somewhat different from those that Ostrom has studied, the lessons are likely transferable.

10 The approach follows McBride et. al. (2011). A probabilistic approach to the same problem is found in Genicot and Skaperdas (2002). Both of those papers employ multi-period models in contrast to the static model we use in this paper.

By modifying the payoff function in (7), we can derive a new Nash equilibrium among rulers that eventually leads to the following modified version of equilibrium in number of producers, guards, and warriors:

$$\hat{P}(\sigma) = \frac{4R}{M(\sigma)}N$$

$$R\hat{G}_i(\sigma) = \frac{R}{M(\sigma)}N, \tag{13}$$

$$R\hat{W}_i(\sigma) = \frac{4k(1-\sigma)(R-1)}{M(\sigma)}N, \tag{14}$$

where $M(\sigma) = (5 + 4k(1-\sigma))R - 4k(1-\sigma)$. An increase in σ (i.e., higher commitment or higher security) plays the same role as a decrease in the effectiveness of conflict (lower k). Higher commitment capability increases the total number of producers and increases the number of guards hired but, given that rulers trust one another more, decreases the number of warriors.

Naturally, given that there are more producers within each ruler's territory and fewer warriors need to be hired, a ruler's equilibrium profits increase as well:

$$\pi_i(R, k, \sigma) = \frac{(3 - 4k(\sigma))R + 4k(1-\sigma)}{4RM(\sigma)}N. \tag{15}$$

Because σ can be thought of as a collective good for the rulers and there might be actions they could take to modify it (by, for example, hiring a podesta or simply starting to meet with one another for diplomatic reasons), we can think of commitment as a function of investments made by the rulers themselves. That is, let $\sigma = \sigma(\sum_{j=1}^{R} I_j)$, assumed to be strictly increasing in its argument, where I_i denotes the cost of the investment by ruler $i = 1, 2, \ldots, R$. Then, by first making investments before making the other choices, the ruler's payoff function is modified as follows:

$$\pi_i\left(R, k, \sigma, \sum_{j=1}^{R} I_j\right) = \frac{\left(3 - 4k\left(\sigma\left(\sum_{j=1}^{R} I_j\right)\right)\right)R + 4k\left(1 - \sigma\left(\sum_{j=1}^{R} I_j\right)\right)}{4RM\left(\sigma\left(\sum_{j=1}^{R} I_j\right)\right)}N - I_i. \tag{16}$$

We can analyze the Nash equilibrium in investments in commitment, with straightforward results, with investments being higher the larger the population N and the smaller the number of rulers R (see McBride et. al. 2011, for details in a more general, dynamic model but with similar characteristics). There are, however, some other important considerations that merit discussion:

- The equilibrium and payoffs we have described here are for a given number of rulers. Because there might still be entry of new potential rulers, another consideration in the collective interest of existing rulers is to take measures that will make new entrants less likely.
- The investments that maximize the sum of profits in (16) are clearly higher than those obtained in Nash equilibrium. Therefore, a complementary consideration to increasing commitment and trust might be in engaging in more cooperative behavior by making investments that are higher than those in Nash equilibrium. Therefore, there are multiple areas in which existing rulers could cooperate and increase individual and collective profits: investing in commitment; increasing investment in commitment to their collectively maximal levels; and engaging in entry-deterring measures against potential challengers.
- All the rulers have been assumed to be identical up to this point. Breaking that symmetry can not only change some key results but also bring new insights. For example, a simple way to break the symmetry would be to modify (12) in the following way:

$$P_i = \left[\sigma\alpha_i + (1-\sigma)\frac{W_i^k}{\sum_{j=1}^{R} W_j^k}\right]P \quad \text{where} \quad \Sigma_{j=1}^{R}\alpha_j = 1;\ \alpha_i \in (0,1),$$

where the share received by each ruler is replaced in the case of perfect commitment by an arbitrary share α_i instead of the equal share $\frac{1}{R}$. This change might reflect some initial advantage that some rulers might have over others. When calculated, the equilibrium results with this change and end with a modified equilibrium payoff function of (16) (which would be different for different rulers); therefore, we can show that only the ruler with the highest α_i would have an incentive to invest in commitment. We could conceive of that ruler as providing leadership, being first among equals, and providing a way of thinking about how a king could emerge out of an originally undifferentiated mass of rulers.

- One important caveat to the preceding discussion of asymmetry is that a king, once he gains greater power than other rulers, might no longer want to invest in commitment measures that benefit all rulers but would want to enhance his power by creating a "king's court" or a "Star Chamber." Rule of law for elites is no simple matter to achieve.

- Also, the collective and individual interest of rulers is to decrease the costs of extraction from producers. That could also be achieved through investments in changing norms, through the acceptance and dissemination of ideologies and religions that enhance their profits. For example, having producers believe that there is a single God whose sole representative on earth is their current ruler is helpful in reducing resistance and acceptance of the taxes they pay to that ruler.

Such considerations indicate the rich set of possibilities that exist in evolving beyond organized anarchy into the hierarchical proprietary states that have existed in most of history (Finer 1997 provides a great overview as well as detail of states in history). Their organization is more complex and involves not just extracting tribute and providing collective goods but also developing and maintaining intra-elite cooperation and propagating unifying and profit- (and efficiency-) enhancing ideologies among its subjects.

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