GUNS, LAWYERS, AND MONEY: ECONOMIC CONSEQUENCES OF COSTLY CONFLICT

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ABSTRACT: Conflict and appropriation are costly activities that are economically significant, yet the assumption of perfect and costless enforcement of property rights in much of economic research has limited their systematic study. Conflict follows directly from the methodological principle of self-interest and taking it into account in modeling leads to very different findings than in its absence: in straightforward extensions of basic models of exchange, compensation is inversely related to marginal productivity; prices depend on relative power, as well as on preferences and endowments; exchange itself can be foreclosed by enforcement costs; the costs of security critically depend on governance and norms of behavior; wage subsidies, land reform and other seemingly inefficient arrangements can be rationalized as appropriate policies in second-best settings; and comparative advantage is distorted in the presence of conflict. Overall, in the presence of conflict and appropriation Nirvana or first-best models are not empirically plausible. Aspects of modern governance like checks and balances and the bureaucratic form of organization can partly be thought of as restraining conflict and appropriation. These restraints are better than the typical governance alternative, which is personalized, proprietary governance and typically involves autocratic, amateurish, and corrupt rule.

> The first principle of economics is that every agent is actuated only by self-interest. The workings of this principle may be viewed under two aspects, according as the agent acts without or with, the consent of others affected by his actions. In wide senses, the first species of action may be called war; the second, contract.

Edgeworth, *Mathematical Psychics,* 1881 (pp.16,17)

> "[T]he efforts of men are utilized in two different ways: they are directed to the production or transformation of economic goods, or else to appropriation of goods produced by others.

Vilfredo Pareto, *Manual of Political Economy,* 1906 [1972, p. 341]

Despite Edgeworth's or Pareto's references to "war" and "appropriation" as central aspects of economic behavior, the dark side of self-interest has not had a place in the paradigm that Edgeworth and Pareto helped develop and which has dominated economics for more than a century. Arming, fighting, stealing, defending, rioting, resisting, or protesting have had no place in economic modeling as an integral part of the economy. Though, more recently, there have been areas of research that have emphasized the economic approach to crime or conflict as a way of understanding crime or conflict, the feedback from these activities as generic *economic* activities that affect resource allocation in any systematic way has had virtually no influence on the thinking of economists. Instead, over the past century, political scientists and public policy analysts have had the monopoly in integrating economics and security concerns.

I define *conflict* to involve situations in which two or more parties choose costly inputs that (i) are adversarially combined against one another and (ii) generate no positive externalities to third parties. Condition (i) is fundamentally different from the collaborative combination of inputs that are usually considered in economics through production functions. Arming by adversaries is one stark example of the adversarial combination of inputs, but is far from being the the only one. The expenditures on lobbying and rent-seeking by political adversaries, pure influence activities in organizations, or legal expenditures by litigants are other examples of such adversarial combinations of inputs. Condition (ii) in the definition excludes situations in which the adversarial combination of inputs has positive externalities on others so that these efforts play some socially productive role. Examples that satisfy condition (i) but not condition (ii) include tournaments within organizations and sports contests. For tournaments in organizations, one employee's higher level of effort might increase that employee's probability of successful promotion and lower the probability of promotion of other employees and therefore efforts could be considered adversarial and satisfy condition (i), yet that effort is usually productive from the organization's point of view so as not to satisfy condition (ii). Likewise in sports athletes and teams exert effort against one another, but the level of effort affects the quality of the game or match for the enjoyment of the sports audience, which is external to athletes and teams.

This definition of conflict applies to civil and international wars, lower-levels of domestic conflict, crime and crime-fighting, as well as to any situation in which there is arming or other costly input expenditure without necessarily having any active warfare or overt conflict. In addition, to the extent that there are minimal externalities to third parties, economic environments of non-violent conflict that involve adversarial activities like litigation and lobbying follow similar principles as we shall see. Such cases of non-violent conflict, which are important for modern economic activity, involve to a great extend expenditures on resources that attempt to persuade one or more decision-making actors. For instance, in the case of litigation, the litigants attempt to persuade a judge or members of a jury whereas in the case of lobbying, lobbyists produce argumets to persuade politicians, their staff, administrators, or the general public.

Conflict follows directly from the methodological principle of self-interest. For anybody who espouses that principle the absence of appropriation is an assumption. Nevertheless that assumption is rarely invoked explicitly, except in the guise of perfect and costless enforcement of property rights ("Nirvana," to use Demsetz's (1969) colorfoul term). Given the large economic costs of enforcement, the question then emerges of whether this assumption of perfect and costless enforcement of property rights is inconsequential for resource allocation.

In this paper I will argue the following:

- Conflict induces costs that are economically very significant. These costs can be thought to be induced in the case of violent conflicts by insecure property rights. Even when property rights are thought to be secure, however, their enforcement by the state and by citizens is expensive and therefore economically significant. The costs induced by conflict can be reasonably thought of as being at least as important as the deadweight costs induced by any distortions that are more commonly analyzed by economists.

- The costs of conflict are not inevitable. They depend on the degree of property rights protection, on state capacity and governance in general, as well as on norms. These factors reduce

- Modeling conflict and appropriation leads to different findings and predictions than those derived in the absence of appropriation.

- In particular, in straightforward extensions of basic models of exchange, compensation is inversely related to marginal productivity; prices depend on relative power, as well as on preferences and endowments; exchange itself can be foreclosed by enforcement costs; the costs of enforcement themselves critically depend on norms of behavior and bargaining; and, comparative advantage can be significantly distorted in the presence of conflict. Overall, in the presence of conflict and appropriation Nirvana or first-best models are not empirically plausible.

- Controlling and governing conflict and appropriation are thus important economic activities as well. Proprietary or for-profit governance has been

by far the most prevalent form of governance historically. However, it appears that instead of helping solve the problem of conflict, proprietary governance in many respect exacerbates it. Modern governance appears better suited to at least partially control the dark side of self-interest.

The main arguments developed in this paper arise from the literature on conflict in which Jack Hirshleifer and Herschel Grossman were major contributors. However, its implications go way beyond that literature and are related to at least two other broad areas of research within economics. One area of research has emphasized the central role of transaction costs and institutions in the economy (see, e.g., North, 1990, or Coase, 1992). Although the term "transaction costs" has been widely used, it has rarely been modelled or identified in concrete cases. The costs of conflict, appropriation, and enforcement that I examine and model in this paper are important compoments of such transaction costs. A major theme pursued here is how different institutions, governance, or norms induce different transaction costs and affect welfare and efficiency in ways that are very different from those predicted by first-best, Nirvana models in which there are zero transaction costs.

The second area of complementary research is recent work on institutions and economic performance that has emphasized the crucial role of conflict (Acemoglu, Johnson, and Robinson, 2005) and power (Olson, 2000). Perhaps even more than this work, this paper emphasizes the quantitative significance and central importance of the costs of conflict and appropriation. The importance of such costs appears to even be of interest to organizations like the IMF. Its formert Director of its Research Department, appears to urge such studies in a note entitled "Assume anarchy? Why an orthodox economic model may not be the best guide to policy" (Rajan, 2004).

1 The empirical relevance of conflict

In this section, I provide examples of some costs associated with conflict and appropriation. (Skaperdas (2008) provides a review of empirical studies of the costs of conflict.) The list is far from being comprehensive or exhaustive, but it should at least provide the reader with a sense of the quantitative importance of such costs and, therefore, of their empirical relevance for economics. These costs can be broadly classified into *direct* and *indirect* costs. The former include direct expenditures and the costs of the destruction due to conflict, whereas the latter include the reduction in trade and investment distortions that can take place as a result of conflict.

Defense expenditures

All sovereign states expend some resources on (external) defense expenditures. Military expenditures vary widely across different countries, rarely going below 1% of GDP but in a few cases, as in the case of Saudi Arabia - tend to go above 10% of GDP.[1] For 2004 world military spending was estimated to be over

[1] In fact, for 1991 and probably because of payments associated with the first Gulf

1 trillion dollars, about 2.6% of world GDP (SIPRI, 2005, p.10). Military spending data does not include some other defense expenditures on intelligence or on civilian R&D that is in practice military R&D.[2] The variation of expenditures across countries (in terms of fractions of GDP) suggests that there might be mechanisms that could reduce such expenditures and thus make more resources available for civilian uses.

In addition to defense expenditures some countries have experienced interstate wars – and have incurred the costs associated with such wars – during the post-WWII period, but the numbers are not comparable to those associated with civil wars during the same period.

Civil wars

More than 70 countries have experienced civil war since World War II (Fearon and Laitin, 2003, p.75). The median length of such wars hs been more than seven years and the costs include: the cost of arming, the wages or opportunity cost of soldiers or guerrillas, the loss of life (at least 16 million in such wars), injuries and psychological incapacitation that can be long-lasting, the destruction of crops, buildings, infrastucture, and other collateral costs that have been analyzed by World Bank researchers (Collier et. al., 2003).

In addition to these direct costs of civil wars, there are indirect costs due to the economic distortions that are due to war. These include static and dynamic misallocation of resources. For example, the diversion of resources to conflict reduced capital formation that, in turn, reduces production possibilities and welfare in the future. Based on accepted methodology, Hess (2003) has estimated the welfare costs of conflict (that does not include just civil wars) for a large sample of countries over thirty years to be on average 8 percent of steady-state consumption. Whereas the costs for high income countries are typically below that, for many low-income these costs are much higher, approximating half of consumption. Low-levels of growth, in turn, increase the risk of civil wars (Miguel et. al., 2004) that can lead to a vicious cycle of war and lower incomes.

Organized crime

war, Saudi Arabia's military expenditures went over 22% of GDP. Japan is one country with its military expenditures hovering around or just below 1% of GDP, although these expenditures ahave been large in absolute numbers and have consistently exceeded US $ 40 billion over the past decade. Note that Japan's Constitution prohibits a military and, thus, formally these are considered "police" or "internal security" expenditures. (All information from the Stockholm International Peace Research Institute (SIPRI), http://first.sipri.org/non_first/result_milex.php?send)

[2] However, some military R&D expenditures have direct civilian applications or are disguised civilian R&D. In fact many major breakthroughs in technology – the internet, various high-tech materials, computers, shipbuilding – have their roots in military R&D. One could possibly argue then that military spending is worth it just for the tremendous technological spillovers that it has had in history. However, why should one spend money on military R&D in the hope of receiving some uncertain technological spillovers in the future, instead of directly spending them on R&D for targeted civilian applications?

The effect of military expenditures on economic growth has been difficult to estimate, as there are many different channels through which military expenditures can affect economic growht. Dunne et. al. (2005) provide an overview of the econometric issues and problems that exist in estimating that relationship.

From Southern Italy (Gambetta, 1993) to Russia and other post-Soviet states (Varese,), Japan (Hill), Afghanistan, Bolivia, Peru, and Colombia (Clawson and Lee, 1998), to Mexico, U.S. inner cities (Jankowski, 1991) and some outwardly legitimate organizations (Jacobs,), organized crime groups have control over sizable chunks of economic activity. Organized crime emerges out of the power vacuum that exists when there is an absence of state enforcement which, in turn, can have a number of different sources: prohibition of drugs and other commodities, illegal human trafficking, geography, ethnic or social distance from the seat of government, or simply collapse of state institutions as it occurred in many post-Soviet countries or Afghanistan. As argued in Skaperdas (2001), the costs of organized crime have similarities to those of civil wars, both in terms of their direct effects and their long-term indirect welfare effects: contract enforcement is expensive and primitive compared to that available in modern states; the rents attract unproductive competition between mafias and gangs; productive investment in physical or human capital is discouraged. Recent trends are not encouraging according to Naim (2005), as a more economically globalized world has produced bigger gaps in governance which organized groups are eager to fill.

Other forms of domestic conflict and terrorism

Besides civil and mafia wars, there are other lower-level forms of conflict within countries. Ethnic, religious, or social rivalries can lead to exclusion and violence with long-term economic consequences. Military coups and security force rivalries also commonly occur in many countries, without them necessarily breaking out in civil war. Protests, strikes, lockouts, and their possible suppression by governments are other examples of domestic conflict. Although I am not aware of attempts to measure the associated costs of such activities, Rodrik (1998, 1999) considers them critical in understanding economic performance in low-income countries.

A clever method for estimating the costs of conflict, applied to the case of conflict in the Baque region of Spain, has been developed by Abadie and Gardeazabal (2003). The effects of terrorism can also be substantial in low-income countries, though they appear to be negligible in high-income ones (Sandler and Enders, 2006).

Costly enforcement of property rights

Many incidents of local conflicts have been reported lately from China (see, e.g., Jacques, 2005) that involve peasants who have traditionally farmed land that is now at the outskirts of cities, but whose officials and local party members want to appropriate for other uses that might be or might not be more socially efficiently. Such clashes between traditional (typically communal) land rights and attempts at appropriation (either for private or, as in many cases in China, for the ostensibly communally owned municipal enterprises) aimed at different types of land use have been common in other countries and in history, with the enclosure movement in England being one well-known example. India, rural Russia, and perhaps most countries today do not have land-ownership law or

when such law exists it is not enforceable.[3]

With community enforcement of traditional land rights weakening and without modern property righst, individuals takes private enforcement measures that may or may not involve the threat of violence which are nonetheless undoubtedly costly. However, modern property rights in land as well as other factors of production are far from being inexpensive. For such modern property rights require laws and the legislative institutions that have the commitment power (or, legitimacy) to have such laws last; the title and other agencies that will record and deposit titles and related documents; courts and police that will enforce the laws; the trained professionals like the surveyors, lawyers, judges, bureaucrats, legislators, and police who are needed to staff the different organizations; the institutions of higher learning that will educate them all these professionals; and the belief that the whole chain from legislation to the different levels of enforcement and legal appeals is largely free of corruption. It is obviously expensive to have modern land property rights and is thus not surprising that many, if not most, countries still do not have them.

The cost of common crime and its avoidance is also relevant and quantitatively important. For example, expenditures on prisons by the State of California alone surpassed state expenditures on higher education about a decade ago and now stands at about $8 billion (against $3 billion for higher education [citation here]).

Forms of transnational insecurity

However, there are risks for serious interstate rivalries and wars in the future that are of two broad kinds: those that are dyadic or regional in character and those that are more global in character and would be connected with the probable emergence of one or more new superpower.

Though dyadic or regional rivalries may be associated with ethnic or other primordialist disputes, resource contestation is one economic reason that can be studied more concretely using economic methods. Oil is currently probably the most important such resource, but other minerals and fresh water resources are gaining importance as well according to Klare (2001). The discovered and yet-to-be-discovered oil wealth of Central Asia is fuelling disputes and arming in the area and beyond that could approach a new "Great Game." The states surrounding the Caspian Sea—Russia, Kazakhstan, Tourkmenistan, Iran, and Azerbaijan—have still not settled on a formula for dividing rights of exploration and exploitation for oil. Where claims are settled, oil companies and their governments vie for contracts, rival pipeline routes, bids to buy local rights as well as local firms, and the whole endeavor is tinged with subterranean geopolitical calculations that involve the United States as well as all the lesser powers of Russia, China, and Europe. Further South, with the Iraq war, the Middle East has already become a new battleground with much uncertainty about where it will all lead. And, areas with suspected oil reserves like the South China Sea

[3] For example, India has law but too many many of them that are hopelessly entagled, because they come from the different legal traditions of the county. For example, Lewis (2004, p.199) reports: "It is not clear who owns land in India. Over 90 percent of land titles are unclear."

(around the Spratly and Paracel islands) have been already contested in minor hot incidents as well as diplomatically by seven countries (China, Taiwan, Vietnam, the Philippines, Indonesia, Malaysia, and Brunei).

Beyond oil, fresh water has perhaps been underrated for its potential to create havoc in many areas with rapidly increasing populations, economic growth, and economic globalization. It is not well-known, for instance, that Egypt has threatened its upstream neighbors, especially Ethiopia, with bombing water facilities if they were to go ahead with irrigations projects on the Nile (Klare, 2001, p.153). In the coming years, the countries of the Upper Nile and the tributaries that drain into Lake Victoria (Sudan, Ethiopia, Kenya, Uganda, Tanzania, Rwanda, Burundi, Congo) will need to draw more water from the river, but any significant reductions in the downstream flow to Egypt could have catastrophic effects to the economy of that country. (Economic globalization intensifies demand for water resources primarily through the demand for water-intensive agricultural products, as is the case for Egyptian cotton.) We cannot predict how, or whether, such disputes will be resolved peacefully. In the meantime, it should surprise no one if impoverished Ethiopia buys state-of-the-art anti-aircraft batteries. Some other examples of rivers that have induced or are likely to induce contention include the Jordan river (involving Israel, Jordan, Syrian, and the Palestinians), the Tigris and Euphrates (involving Turkey, Syria, and Iraq), the Indus (Afghanistan, Pakistan, India), the Brahmaputra (China, India, and Bangladesh), and the Mekong (China, Thailand, Laos, Campodia, and Vietnam).

The second type of insecurity that is looming on the horizon is the real or imagined rise of a peer competitor to the military and economic preeminence of the United States. The most widely mentioned and discussed candidate is China. Before September 2001 the role of China had been widely debated especially in connection with its WTO accession. The proponents of China's admission into the WTO were offering the liberal gains-from-trade and peace-through-trade arguments, whereas its opponents were offering the realist it-will-come-back-to-bite-you argument as well as more ideological arguments regarding the nature of China's polity and its relation to Taiwan. Whereas it would take China decades to become a genuine peer competitor to the US, in the absence of significant or prolonged measures not just to improve relations, but also to eliminate all suggestions of hostile intent on either side, the present calm could well turn out to be the calm before the storm.[4]

Influence, lobbying, and litigation [to be done; Laband and Sophocleus, 1992]

From land, to oil deposits, water resources, and shares in corporations, property rights are costly to enforce by governments and interested parties, whenever

[4] Of course there is the possibility of other states becoming peer competitors to the United States, even some seemingly unexpected ones at the moment. For example, Japan possesses the nuclear and missile technologies to become a major nuclear power within a short period of time. While now Japan might not aspire to become a nuclear power, a confirmation of North Korea's nuclear status or higher perceived threats from China could well make Japan a nuclear power, after sufficient preparation of its domestic opinion. A nuclear Japan would radically change world balance of power, even if it does not evolve to a US peer competitor.

such rights legally exist. In other instances, some examples of which have been discussed here, property rights do not even exist and private costly enforcement under "anarchy," often with the threat of violence in the background. The associated costs are economically very significant and, in many ways, dwarf the deadweight costs of ordinary distortions on which economists typically focus.

One question that emerges then is whether, regardless of the quantitative importance of these costs, do the essential insights from existing Nirvana models continue to hold? If they do not, how are the findings modified and how do they change our interpretation of reality?

2 The adversarial nature of inputs to conflict

Before proceeding with the examination of specific models that allow for conflict and appropriation I should note that in such settings the main inputs of conflict – be it arming, influence, or lobbying – are not combined collaboratively, as when one side expends more of it, the other side can be expected to have a lower payoff. That is, the process is fundamentally *adversarial* and could hardly be described by an ordinary production function. This is one major substantive difference between ordinary productive inputs and the inputs of conflict that can be better considered non-productive.

In stark settings like war, the main possible outcomes are wins and losses. These outcomes can be considered probabilistic, as functions of the inputs expended by the adversaries. Peace settlements or cold wars under the threat of hot wars are typical outcomes as well, as we will discuss in the next section. However, what could occur in the case of a hot war affects both the bargaining power and the outwardly peaceful outcomes of a settlement or a cold war. Similarly, in cases of influence or lobbying, the outcomes of all-out competition between adversaries are wins or losses, but compromises often take place as well. Nevertheless, any compromise would ultimately depend on the adversaries' expenditures on influence and lobbying, just as peaceful settlements of potential enemies would at least partly depend on their arming expenditures.

The functions that translate conflictual inputs in probabilities of wins and losses have been described as "technologies of conflict" (Hirshleifer, 1989), rent-seeking functions (Tullock, 1980), or in general as contest success functions. To define such functions, consider two adversaries, labelled A and B, and denote their choice of appropriation levels as g_a and g_b. For any given combination of appropriation levels, we can expect each party to have a probability of winning and a probability of losing. Denote the probability of party A winning as $p_a(g_a,g_b)$ and the probability of party B winning as $p_b(g_a,g_b)$.

For these to be probabilities, they need to take values between 0 and 1, and add up to 1, or that $p_b(g_a,g_b) = 1- p_a(g_a,g_b)$. Moreover, we can expect an increase in one party's guns to increase that party's winning probability and reduce the winning probability of his opponent; that is, we should have $p_a(g_a,g_b)$ be increasing in g_a and decreasing in g_b.

A wide class of functional forms that has been examined is the following

additive form:

$$p_a(g_a, g_b) = \frac{f(g_a)}{f(g_a) + f(g_b)}$$

provided g_a or g_b is positive (otherwise, $p_a(g_a, g_b) = 1/2$) and where $f(\cdot)$ is a non-negative, increasing function. I will be using such functions for the rest of this paper. For the greater part, for simplicity I we be wemploying the form with $f(g_i) = g_i$, so that:

$$p_a(g_a, g_b) = \frac{g_a}{g_a + g_b}$$

Also introduce asymmetries as a way of modeling property rights.

3 Enforcement costs as a function of norms and governance

We have seen that military expenditures differ widely across countries. The same is true in terms of crime rates, rates of incarceration, and the costs associated with both. However, the relationship between security, the public good that military expenditures and anti-crime spending are considered to buy, and the expenditures themselves can be hardly related. In a "Nirvana" or a "cross-my-heart" society (Schelling, 1960), where crossing one's heart implies perfect commitment, one can have perfect security without incurring any enforcement costs. Such a level of security would be difficult to achieve in a Hobbesian polity regardless of expenditures. These expenditures would be included in the measured GDP of the Hobbesian polity, which could well be higher than the measured GDP of the "cross-my-heart" society despite the latter's much higher security and possibly higher overall welfare. Actual economies and societies fall in between such two extremes, yet the variation in enforcement costs and security expenditures can neverthelless vary widely. In this section, I will discuss some of the determinants of differential security costs using a very simple model.

Consider two parties, labeled A and B, to have total (gross) income Y.[5] Suppose A has secure possession of σ_a portion of that income whereas $B's$ secure share is σ_b. Thus, a share $\sigma \equiv \sigma_a + \sigma_b \in [0, 1]$ of total income is secure. If the parties are within the same country, the security of that income can be considered to be guaranteed by the state. If the parties are located in different countries or if the are countries themselves, security could emanate from practically enforceable international law, the international collective security arrangements that have prevailed in the post-war period, or through other bilateral and multilateral agreements. We can think of that security as being due to "governance.[6]"

The remainder insecure income, $(1 - \sigma)Y$, is contestable by the two parties through arming. However, contrary to our approach up to this point whereby

[5] The model and analysis is based on Garfinkel, McBride, and Skaperdas (2012).

[6] We can think of governance as encompassing both political institutions and arrangements as well as conventions or norms about property that may not be supported by particular institutions.

fighting and settlement under the threat of fighting lead to the same expected payoffs, we consider fighting and settlement to lead to different outcomes. In particular, we consider the case in which fighting leads to the destruction of some of the insecure income so that only $\phi(1-\sigma)Y$ ($\phi \in (0,1)$) is left to the winner of fighting. To be clear, we consider the following sequence of moves:

1. A and B choose costly levels of arming, g_a and g_b.

2. Each side makes a choice of whether to fight or to divide the contested income according to a given division rule $v^\beta(g_a, g_b)$ (to be specified below), where $v^\beta(g_a, g_b)$ is the share of insecure income received by A and $1 - v^\beta(g_a, g_b)$ is the share received by B. If either side chooses to fight, the two sides fight with the following expected incomes:

$$y_a^f(g_a, g_b) = \sigma_a Y + \frac{g_a}{g_a + g_b}\phi(1-\sigma)Y - g_a$$
$$y_b^f(g_a, g_b) = \sigma_b Y + \frac{g_b}{g_a + g_b}\phi(1-\sigma)Y - g_b$$

3. If both sides choose to settle, then their incomes are the following:

$$y_a^\beta(g_a, g_b) = \sigma_a Y + v^\beta(g_a, g_b)(1-\sigma)Y - g_a \tag{1}$$

$$y_b^\beta(g_a, g_b) = \sigma_b Y + (1 - v^\beta(g_a, g_b))(1-\sigma)Y - g_b \tag{2}$$

Please note that in place of the general contest success function $p(g_a, g_b)$ we have used the specific functional form $\frac{g_a}{g_a+g_b}$ for party $A's$ probability of winning. Given the settlement incomes in stage 3 and the conflict expected incomes described in stage 2, in stage 2 party A will choose to settle if and only if

$$v^\beta(g_a, g_b) \geq \frac{g_a}{g_a + g_b}\phi \tag{3}$$

and, similarly, party B will choose to settle if and only if

$$(1 - v^\beta(g_a, g_b)) \geq \frac{g_b}{g_a + g_b}\phi \tag{4}$$

Because $\phi < 1$, for any given choice of guns (g_a, g_b), there is a range of possible division rules that satisfy both (11) and (12). We shall consider only such rules that always yield settlement as part of any subgame perfect equilibrium and for any combination of guns (g_a, g_b) that might be chosen in stage 1. Moreover, we consider the following class of rules parametrized by $\beta \in [0,1]$:

$$v^\beta(g_a, g_b) = \beta\frac{g_a}{g_a + g_b} + (1-\beta)\frac{1}{2} \tag{5}$$

This class of rules includes the following three possibilities:

a. ($\beta = 0$) When the insecure income is divided in half regardless of each side's choice of guns (this is an example of a "cross-my-heart" society).

b. ($\beta = \phi$) When the insecure income is divided according to any symmetric axiomating bargaining solution (including the Nash and Kalai-Smorodinsky solutions) where the disagreement payoffs are those under fighting described in stage.

c. ($\beta = 1$) When the insecure income is divided according to the probability of winning ($\frac{g_a}{g_a+g_b}$ for A and $\frac{g_b}{g_a+g_b}$ for B).

The settlement incomes in (9) and (10) along with a specific rule in (13) constitute a well-defined game. The Nash equilibrium choices of guns, denoted by (g_a^β, g_b^β),are the following:

$$g_a^\beta = g_b^\beta \equiv g^\beta = \frac{\beta(1-\sigma)Y}{4} \tag{6}$$

The corresponding equilibrium incomes are the equal to:

$$y_i^\beta(g^\beta, g^\beta) = \sigma_i Y + \frac{2-\beta}{4}(1-\sigma)Y \quad i = A, B \tag{7}$$

Note how both gun choices and equilibrium incomes depend on the security or governance parameter σ and on the rule of division or "norm" parameter β. If either all property is secure ($\sigma = 1$)or guns play no role in dividing any surplus ($\beta = 0$), no guns are chosen and incomes are maximal. As property becomes more insecure (σ becoming lower) or as more weight is given to the disagreement point in bargaining (β is rising), more resources are expended on guns and less income is left for consumption or other purposes.

Thus, we can see how enforcement costs and incomes can vary widely accross different jurisdictions depending on the governance and norms that determine how parties in actual or potential conflict interact. Different levels of security costs are consistent with widely different levels of actual security and incomes. In the last section of this paper the degree of security is endogenized as a function of investments in a collective good undertaken by the two parties.

4 Productivity and compensation in general equilibrium

For reference, we begin with a simple textbook model of exchange of the type examined by Edgeworth (1881). Consider two individuals, labeled a and b, and two goods, fish (f) and corn (c). a holds an endowment e_a that can be converted one-to-one into fish and b holds and endowment e_b that can be converted also one-to-one into corn. Consumption of f_i of fish and c_i of corn by $i = a, b$ induces utility $U(f_i, c_i)$, which, for simplicity, we assume to be linearly homogeneous and normalized so that $U(0, 0) = 0$.

Neoclassical economics has exhaustively analyzed such settings. The determination of prices (or, exchange ratios) by bargaining or competition, their relationship to scarcity and preferences, and the compensation of differenent

agents have been main concerns of this literature. Regardless of the approach taken, there is a tendency for outcomes to have the property that goods that are more valued to have higher prices, and those who hold such goods to receive higher incomes and utility. For instance, under competitive pricing, the final utility received by a can be shown to equal $e_a \frac{\partial U(e_a,e_b)}{\partial f}$ and the utility received by b is $e_b \frac{\partial U(e_a,e_b)}{\partial c}$. Suppose $e_a = e_b = E$. Then, the person who would receive higher utility would also be a if and only if $\frac{\partial U(E,E)}{\partial f} > \frac{\partial U(E,E)}{\partial c}$. That is the person who, other things being equal, holds the endowment that contributes higher marginal utility also would receive higher compensation.[7]

Moreover, such a property does not hold just for the case of exchange and utility. The simple problem of exchange we are discussing is analytically isomorphic to the basic problem of production, whereby the endowments of a and b are inputs used in the production process

$$V^b(g_a, g_b) = (1 - p(g_a, g_b))U(e_a - g_a, e_b - g_b) \tag{8}$$

An increase in one side's guns increases the share of total utility received but decreases the production of consumables, fish in the case of a and corn in b's case. This tradeoff appears when we take the partial derivative of each side's payoff with respect to own guns:

$$\frac{\partial V^a(g_a, g_b)}{\partial g_a} = \frac{\partial p(g_a, g_b)}{\partial g_a} U(e_a - g_a, e_b - g_b) - p(g_a, g_b) \frac{\partial U(e_a - g_a, e_b - g_b)}{\partial f} \tag{9}$$

$$\frac{\partial V^b(g_a, g_b)}{\partial g_b} = -\frac{\partial p(g_a, g_b)}{\partial g_b} U(e_a - g_a, e_b - g_b) - (1 - p(g_a, g_b)) \frac{\partial U(e_a - g_a, e_b - g_b)}{\partial c} \tag{10}$$

The first term in each of the two derivatives represents the marginal benefit of a small extra unit of guns whereas the second term represents the marginal cost of guns. Note how the second component of the marginal cost of guns is the marginal utility of the good produced by that side. Thus the higher the marginal contribution of one side, the higher is its marginal cost of guns. As we shall see shortly this property has significant implications for the pattern of distribution. A unique Nash equilibrium (g_a^*, g_b^*) can be shown to exist under mild conditions.[8] An interior equilibrium is characterized by setting (4) and (5) equal to 0. By doing that it can be shown that

[7] For exceptions, see literatures on "manipulation of endowments" or "immiserizing growth." [Postlewaite, Bhagwati.]

[8] For existence, it is sufficient that the contest success function $p(\cdot,\cdot)$ is not too convex in its first argument ($\frac{\frac{\partial^2 p(g_R,g_X)}{\partial g_x^2}}{\frac{\partial p(g_R,g_X)}{\partial g_x}} < \frac{\frac{\partial p(g_R,g_X)}{\partial g_x}}{p(g_R,g_X)}$). For uniqueness, it is sufficient that $p(g_R, g_X) = \frac{f(g_R)}{f(g_R)+f(g_X)}$ for some positive and increasing function $f(\dot{\cdot})$. Proofs can be found in Skaperdas and Syropoulos (1997).

$$\frac{\frac{\partial p(g_a^*,g_b^*)}{\partial g_a}}{-\frac{\partial p(g_a^*,g_b^*)}{\partial g_b}}\frac{1-p(g_a^*,g_b^*)}{p(g_a^*,g_b^*)}=\frac{\frac{\partial U(e_a-g_a^*,e_b-g_b^*)}{\partial f}}{\frac{\partial U(e_a-g_a^*,e_b-g_b^*)}{\partial c}} \tag{11}$$

Under the same conditions that ensure existence of equilibrium, the left-hand-side of this equation can be shown to be greater than 1 if and only if $p(g_a^*, g_b^*) < 1/2$ or if and only if $g_a^* < g_b^*$. Then, say, for b to be *more powerful* and receive the larger share of the total pie ($g_a^* < g_b^*$), by (6) we must have $\frac{\partial U(e_a-g_a^*,e_b-g_b^*)}{\partial f} > \frac{\partial U(e_a-g_a^*,e_b-g_b^*)}{\partial c}$, or that b must be *less marginally productive* at the equilibrium point. To facilitate comparison with the simple exchange model of the previous section, let $e_a = e_b = E$. It can then also be shown that b is more powerful if and if only if $\frac{\partial U(E,E)}{\partial f} > \frac{\partial U(E,E)}{\partial c}$.[9] Note that this is the exact opposite outcome from the case of completely secure property rights that we discussed earlier. When property is insecure, the side that is more productive has a comparative disadvantage in grabbing and, in equilibrium, it prefers to contribute relatively more to production and relatively less to guns which in turn results in lower welfare than its opponent. The less productive side has a comparative advantage in grabbing as it faces a lower opportunity cost of guns (in terms of useful production) and receives a bigger part of the total pie.

We do not have to go far back in history to find evidence of the relationship between productivity and power. It appears that warriors, knights, lords and generally specialists in violence appeared to have enjoyed higher consumption than the peasants who were the actual producers and over which those specialists ruled.

Of course, the possibly inverse relationship between productivity and power is just a tendency that is not absolute. Someone who is better compensated could have the absolute advantage in production as well. But allowing for appropriation casts serious doubt on the presumption that those who are better compensated are also necessarily more productive, a presumption that appears widespread in empirical assessments of relative worth.

Moreover, regardless of absolute advantage, the dynamic incentives created by the possible static disadvantage that higher productivity confers can be seemingly perverse. As Gonzalez (2005) shows, even superior technologies that available at zero cost could be easily rejected in favor of inferior technologies that would not provide the strategic disadvantage of the superior technologies. The water mill for example had been used by the first century AD in the Roman world but was not generally adopted until the eleventh century. Similar fates had befallen numerous other innovations from the classical world as well as China (see Baumol, 1990, for examples and arguments).

Another obvious difference from the received economic model of exchange concerns the costs of arming and conflict themselves.[10] These costs can be

[9] For the proof, see Skaperdas (1992). For additional comparative static results of a more general model, see Skaperdas and Syropoulos (1997).

[10] I have not distinguished here the conditions under which actual conflict occurs versus those that settlement under the threat of conflict takes place. Incomplete information is obviously one possible reason for parties engaging in actual conflict despite its additional costs (for formal

both static and dynamic. In growth models that allow for appropriation, either as non-durable output (Grossman and Kim, 1996, Mehlum et. al., 2000) or as durable non-productive 'enforcive' capital (Lee and Skaperdas, 1998), its growth-stunting effects become compounded over time. If we were to briefly reflect on the types of capital and large-scale organizations that most human societies had created up to about two centuries ago, we can easily see that it had been heavily weighed towards the appropriative type; protective walls, castles and moats, elaborate siege machines. No civilian equivalent could approach the organizational and logistical sophistication of many armies.

Up to this point we have maintained that appropriative expenditures and other associated costs are primarily due to arming. There are however numerous other forms of appropriative activities that are important and are very different from arming. Whether private or public, almost all organizations are not organized as markets but as bureaucracies. At least some activities within bureaucracies can be considered to be influence activities which have been modelled in a broadly similar fashion to the model described above (see, e.g., Milgrom, 1988, or Mueller and Warneryd, 2001). The problem of the conflict between shareholders and managers is of course very old and at least one part of Russia's dismal economic performance during the 1990s, where asset-stripping and outright stealing of productive assets in the face of weak legislation and enforcement have been rampant. Other activities that can be, at least partly, considered appropriative include litigation expenditures (Farmer and Pecorino, 1999, Hirshleifer and Osborne, 2001) and of course lobbying, 'corruption,' and rent seeking.

How much of such activities can be considered unproductive or non-productive and therefore in some need of control and governance is not a priori clear. However, the point is not where precisely to draw the line but the need to look more closely to the vast world of non-market activities; to begin recognizing that the governance of those activities takes a significant portion of human resources; and that we cannot keep assuming that all these activities are simply deviations or distortions of an ideal world of costless market interactions in which everybody behaves as a saint, except when they need to haggle over price.

5 On the role of power in exchange

Two main points here:

-enforcement costs can foreclose exchange

-prices depend on power

In introducing appropriation in the previous section, we did not allow for the possibility that one or both sides might altogether opt out of the arrangement in which their production is vulnerable to the other side. One possibility is that

models on this point, see Brito and Intriligator, 1985, and Bester and Warneryd, 2000). Actual conflict can also occur without incomplete information because of the compounding rewards to the winner of a conflict, a point that we will discuss in the next section.

they do not produce any fish or corn.[11] Instead, they could produce another good (leisure, for example) that is not appropiable by the other side but also presumably provides lower utility. Yet another possibility would be for each side to have the ability to consume its endowment of either fish or corn as long as it does not open itself to attack by the other side and does not claim the other side's endowment.[12] Although in both cases the cost of arming would be avoided, there would be welfare costs due to the absence of exchange and possible lack of specialization. To clarify what may occur under such conditions, consider the case whereby each side can safely consume its own endowment with the following sequence of decisions:

1. A and B decide whether to consume their respective endowments or open themselves to conflict or exchange. If either side chooses to consume its endowment, then the two sides receive utilities of $U(e_a, 0)$ and $U(0, e_b)$.

2. If both A and B decide to open themselves to conflict or exchange, they make choices between production and appropriation given the constraints in (1). The equilibrium (g_a^*, g_b^*) yields payoffs that can be interpreted as being either the outcome of probabilistic conflict $[p(g_a^*, g_b^*)U(e_a - g_a^*, e_b - g_b^*)$ for A and $(1 - p(g_a^*, g_b^*))U(e_a - g_a^*, e_b - g_b^*)$ for $B]$ or one whereby the two goods are divided under the threat of conflict in accordance with the winning probabilities $[U(p(g_a^*, g_b^*)(e_a - g_a^*), p(g_a^*, g_b^*)(e_b - g_b^*))$ for A and $U((1 - p(g_a^*, g_b^*))(e_a - g_a^*), (1 - p(g_a^*, g_b^*))(e_b - g_b^*))$ for $B]$.

In this second case, A exchanges $(1 - p(g_a^*, g_b^*))(e_a - g_a^*)$ of her fish for a $p(g_a^*, g_b^*)(e_b - g_b^*)$ of $B's$ corn. That is, the linear homogeneity of the utility function allows for only one possible exchange ratio of the two goods.[13] Note how, expressed in this more familiar to economists term, the exchange ratio or price depends not only on the endowments but also in a major way on guns, both through their effect on power and their effect on shrinking of resources that are available for fish and corn. As we have seen from the analysis in the previous section, the valuation of resource or productivity affects the price of fish for coconuts but it does it through guns and in a seemingly counterintuitive fashion, with lower marginal valuation for one's own endowment leading to a higher price of the good supplied.

Given the possibilities outlined, when would the two sides be expected to engage in insecure exchange and when would they be autarkic? Note that if one side is autarkic, then it is a best response to be autarkic as well. That is, autarky is always a Nash equilibrium. The more interesting question is when

[11] The model of the previous section essnentially assumes complete specialization in production. That specialization could be derived from the Ricardian model of trade whereby the two individuals can produce both goods but they endogenously choose to specialize, one in the production of fish and the other in the production of corn.

[12] For example, each side could go :into the "woods" where it cannot be located by the other.

[13] With destruction due to conflict, risk aversion, and other reasons (see Garfinkel and Skaperdas, 2006 for an overview), there would normally exist other feasible exchange ratios that would be preferable to conflict. I will examine a setting that allows for a range of outcomes in the next section.

insecure exchange is an equilibrium. That is the case only if both sides prefer insecure exchange to autarky, or when:

$$U(p(g_a^*, g_b^*)(e_a - g_a^*), p(g_a^*, g_b^*)(e_b - g_b^*)) \geq U(e_a, 0) \tag{12}$$

and

$$U((1 - p(g_a^*, g_b^*))(e_a - g_a^*), (1 - p(g_a^*, g_b^*))(e_b - g_b^*)) \geq U(0, e_b) \tag{13}$$

- Enforcement costs can foreclose exchange
- The more effective appropriation is, the more likely autarky is
- The more productive side has more of an incentive to refrain from exchange

- Complementarity between trading and fighting (Vikings, Russians, Genovese, Venetians, English and Dutch East India Companies, Admiral Ho's expeditions)
- Home-market bias

6 Trade and conflict

Second-best explanations of seemingly inefficient policies:
-wage subsidies (Grossman, 1995, Zak, 1995)
-land reform (Grossman, 1994)
-generic interventions (Dal Bo and Dal Bo, 2004)

- Security externality of trade; liberalism vs. realism. Is China a "strategic partner" or a "strategic rival?"
- distortion of comparative advantage
- enforcement costs and the natural resource curve

Based on Skaperdas and Syropoulos (2001, 2002), Garfinkel, Skaperdas, and Syropoulos (2006).

7 On proprietary governance

[*The two sections that follow are (temporarily and substntially) borrowed from Skaperdas (2003).]*

Olson (1991) and somewhat more emphatically McGuire and Olson (1996) have argued that a "stationary bandit," a king or lord who has a reasonable expectation of maintaining his position for some time, can actually have the

incentives to provide a measure of good governance.[14] The stationary bandit, as the proprietor of the state, provides protection against bandits and robbers using a more efficient technology of protection that can be provided privately by each individual producer.[15] Because collective protection can be provided more efficiently and fewer resources are needed to provide the same level of protection as under a hypothetical anarchy, output should in principle be higher under autocracy than under anarchy. That also implies that more security can be bought with a smaller fraction of the population resorting to banditry and robbery. Higher security can in turn induce the ruler to provide the more traditional infrastructural public goods and stimulate trade and economic development. With a longer time horizon, the profit-maximizing proprietor could lower tribute so that he can stimulate these economic forces even further.

What is a necessary condition, however, for a profit-maximizing ruler to follow non-extortionary taxation and growth-promoting expenditures on public goods is a high degree of certainty that he will be around in the future to reap the rewards of such policies. Since the internal and external challengers to the power and profits of autocrats typically abound, their position can be precarious. Those who have been in power the longest could even be the most paranoid about the future – as Wintrobe (1998, p.39) argues, paranoia is the characteristic personality trait of dictators. The optimal policy of the ruler could then well be the extraction of maximal revenue for the short term. Because the ruler can have greater extractive powers than simple bandits have or because not enough protection is provided by the ruler, producers could be even worse off than under anarchy. (See Moselle and Polak, 2001, and Konrad and Skaperdas, 2012, for formal models that allow for such possibilities, and Marcouiller and Young, 1995, for a model similar to McGuire and Olson's but which can also lead to a disastrous "black-hole-of-graft" outcome.)

The presence of a long horizon that comes from a low uncertainty of future rule by a ruler with an "encompassing interest," though, is by no means sufficient for following growth-promoting policies. For, as Robinson (1997) has argued, many such policies can be at the expense of autocratic rule in the long run. Promoting trade implies that merchants becomes richer and perhaps ask for more rights and a share of power; expanding education can make more of the population become conscious of its subservient status and demand reforms and a change in the status quo; even building roads can make it easier for rebels

[14] A number of articles by economists have examined the problem during the past decade or so. To my knowledge, Findlay (1990) was the first to specify a model of the autocratic state within an optimizing framework. Besides McGuire and Olson (1996), others include Grossman and Noh (1994), Hirshleifer (1995), Marcouiller and Young (1995), Skaperdas and Syropoulos (1995), Robinson (1997), Konrad (1999), Konrad and Skaperdas (1999), and Moselle and Polak (2001). Wintrobe (1998) has engaged in an in-depth examination of dictatorships, as he considers the many different control problems that dictatoships typically face. Usher (1989) has developed an elaborate model of anarchy out of which autocracies may emerge.

[15] McGuire and Olson (1996), as well as Findlay (1990) and others, model the services provided by the state as an ordinary public good, without any explicit reference to the provision of security. The interpretation discussed here follows that of Konrad and Skaperdas (1999).

to reach the capital and drive out the ruler.[16] Thus, long-term survival may well be incompatible with providing the infrastructure public goods that are necessary for development. Robinson's (1997, pp. 23-26) review of the evidence on dictatorships suggests that those with dynastic pretensions and therefore longer horizons have been the most predatory during the twentieth century. Similarly, the dynastic empires of Spain, Russia, or Ancien Regime France were very slow to adopt growth-promoting policies compared to the other more liberal regimes in Europe and, from the eighteenth century onward, compared to the emerging national states.

Overall, then, there is no theoretically or empirically convincing case to be made that a for-profit, proprietary state will necessarily bring an improvement in the material welfare of its subjects. After all, up to less than two centuries ago there were virtually no other types of states and their contribution to material growth had been at best questionable. However, one factor that has been argued to have taken some of the rough edges off autocracies in the West and have very gradually (and, grudgingly, on the part of rulers) led to the developmental policies is *competition* among such states (e.g., North and Thomas, 1973).

7.1 Competing Autocracies

Extrapolating from competition in ordinary economic markets we could expect that competition in the provision of protection and security would also be beneficial. The typical argument runs as follows: Rulers who maximize the difference between tax revenue and the cost of services provided will offer lower taxes and a higher service level, the more rulers there are around. This is because the customers/subjects will tend to be attracted to the rulers with the best combination of tax rates and services. For this type of competition to work, there are two necessary conditions. First, the movement of subjects across states should be of low enough cost. Second, each ruler can commit to their announced tax rates and service provisions - for, otherwise, subjects who are lured in a state face the threat of expropriation once they have chosen their location and have become producers there. If rulers cannot commit, then taxation is determined by the relative power of the two sides: the brute strength of the ruler versus the tax-resistance capabilities of the subjects. Failure of either condition – mobility of subjects or the ruler's ability to commit – cannot guarantee that tax competition among autocratic states will bring about the beneficial outcomes of competition expected in ordinary economic markets.

However, in much of history competition among proprietary rulers appears to have been much less like competition among mineral water producers and more akin to competition among mafia lords. Mafiosi compete less on the prices they

[16] I cannot resist reproducing the following statement (quoted in Robinson, 1997, p.2) by former President of Zaire Mobuto Sese Seko to President Juvenal Habyarintha of Rwanda: "I told you not to build any roads... Bulding roads never did any good.. I've been in power in Zaire for thirty years and I never built one road. Now they are driving down them to get you." Of course, President Mobuto was following the same policies of the former masters of Congo, the Kings of Belgium and especially King Leopold.

charge for protection and more through fighting for, and protecting, their turf. Likewise, rulers have typically worried much more about the armies of their competitors across their borders than about how the fiscal policies of their competitors affect the movement of their subjects. Indeed, autocratic states had to devote most of their resources to defending their territories, with the tributary subjects within them, and fighting against other states. Because those resources expended on arming and fighting are kept away from production and consumption, such competition has very different effects from those of price competition. For other things equal, greater competition – in the sense of having a greater number of states – implies that a greater amount of resources is expended on conflict, which can in turn create greater uncertainty for the fate of the rulers themselves and for the production and investment decisions of the subject populations. Such warlord competition can be worse than atomized anarchy and can be characterized as a higher level of organized anarchy. (For a model of this type of competition and its effects, see Konrad and Skaperdas, 1999. In Azam (2002), though warlords are taken to maximize the welfare of their group and not strictly their own take, the effects can be still be pretty dismal.)

Which type of competition has been most important? The former type of economic competition among autocratic rulers is virtually the sole form of competition really considered but has most likely been overrated. If it were the main form of competition among rulers, even in the West, the world would have developed materially a long time ago. Autocratic rulers can behave differently, though, when they do not face just other autocratic rulers but are under the pressure of economic competition from less autocratic regimes. They can then be forced to provide tax and other privileges. This is the force – the pressure from city states in Italy and the Nertherlands, and from England whose rulers had more restrictions in their power – that Tilly (1992) has identified as those that operated in the West and which gradually induced more economic forms of competition. Autocratic rulers, left by themselves, find more profitable to just fight one another for territory and the tributary subjects that come with it.

Even today, this fighting-for-rents competition is not confined to mafias and gangs. Former President Mobutu Sese Seko certainly was not afraid that his subjects would flee to the greener pastures of other states, although some of them undoubtedly did, and policies of his successors do not appear any different. If anything, from Colombia to many other areas of Africa, to Afghanistan, and many post-Soviet republics, that competition for rents by rulers threatens to become even more important in the medium run.

Overall, though autocratic rule can increase security and help provide other public goods, it often recreates the problems of conflict in anarchy at a higher and more organized level. Autocrats can extract more efficiently from producers than simple bandits can and fighting among such rulers moves the problem of restraining self-interest from individuals to organizations and groups. The political experimentation of the past two centuries, though rather new to assess especially in terms of long-term viability, appears to have been effective in providing at least some answers to the fundamental problem of governance.

8 Modern Governance

Over the past two centuries the tremendous expansion of markets has been primarily of the variety that Olson (2000, Chapter 10) has labelled *socially contrived* markets (as opposed to $self - enforcing$ ones). In these markets, individual participants face potential enforcement problems and other prerequisites that are much more complex than those faced by our example of Robinson and Xena. Take for instance the market for real-estate mortgages. To begin with, the owner of the land and other structures needs to have clear title, something that requires well-defined laws, courts that will enforce them, land registries and other government agencies that oversee zoning and related land regulations, reliable insurance that will cover many contingencies, and every step along the way has to be free of corruption. These attributes might appear to Western eyes easy to satisfy, but they are expensive to set up and difficult to institute in practice. For example, in Russia only recently legislation was voted on the private ownership of land in cities and still no such laws exist for land in rural areas. Clear title is just a prerequisite. The obligations of the lender and borrower, bankruptcy laws and their enforcement, various asymmetries of information are typically even more complex than clarity of title. To have the secondary mortgage market that exists in the United States, another set of complex conditions needs to be satisfied.

Underpinning all the above is a very high degree of confidence on the part of all market participants that none of the contractual terms, the basic laws, and their enforcement will change during the life of the loan. That is, market participants need to have high confidence that whoever is in power cannot change much that concerns them. It is difficult to see how an autocrat with few restraints could inspire enough confidence so that markets such as today's mortgage markets could evolve.

In the West, modern governance evolved out of Absolutism, with a patchwork of restraints, piecemeal extensions of the franchise and other rights, and civil service reorganizations gradually and haltingly introduced. Its main characteristics include checks and balances, separation of powers, formal representation, bureaucratic form of organization, as well as the loyalty of the citizens of national states. I will next argue that these characteristics can, at least partly, be seen as ways of restraining the dark side of self-interest of individuals, organizations, and rulers. My presentation will necessarily be selective, tentative, and speculative at times since economists have done so little work in the area. It therefore also represents somewhat of an agenda for future research.

8.1 Representation, Checks and Balances

Representative government and checks and balances have often began with restraints on the power of rulers that have come about after protracted civil wars. According to North and Weingast (1989) it took almost the whole seventeenth century in England for the Parliament (consisting of nobles) to develop just the beginnings of an effective and lasting check on the powers of the Crown. This

check on the power of the Crown and transfer of conflicts from the battlefield to the political and judicial arenas were according to North and Weingast critical for the subsequent developments in England and in the wider area of Northwestern Europe. However, the process of conflict and settlement that took place in seventeenth century England was by no means unique in Europe (or beyond it), and it took various other forms. Earlier, for example, in twelfth century Genoa, after decades of unresolved civil wars the feuding clans agreed on the institution of the *podesta*, an outsider noble who served for a limited term of one year as administrator and judge but who had enforcement powers limited enough to safeguard against takeover in alliance with one of the clans (See Greif, 1998). Other Italian cities in late Medieval times developed locally adapted institutions of conflict management that were part of the institutional stock of knowledge that could be used in the subsequent centuries.

The English Crown did not cede some of its power out of the goodness of their Kings' hearts. Many of the developments in modern governance over the past two centuries that have benefited wider segments of the population – the extension of the democratic franchise, land reforms, labor legislation, welfare programs – could be interpreted to have emerged under pressure as conflict-alleviating devices. Land reform can be a rational response of landowners who can be better off by giving up some of their land which in turn induces considerably less conflict and banditry (Horowitz, 1993, Grossman, 1994). Employment subsidies can similarly be instruments of conflict resolution (Zak, 1995, Grossman, 1995). Generically, Rajan and Zingales (2000) have shown that in variations of the basic model of section 3 one side can bring about a Pareto improvement by voluntarily transferring ex ante (that is, before the choices of guns are made) some of its initial resources to the other side. However, the range of parameter values over which such ex ante transfers are Pareto-improving can be narrow or non-existent, and even if they are not the savings from reduced conflict are small compared to the gains that can be brought about by more drastic conflict-reducing measures.

Such a drastic measure is implementing transition to a new regime with rulers that are very different. Rosendorff (2001) argues that the transition from apartheid in South Africa was engineered by a cost-benefit calculation on the part of the white ruling elite there. Rosendorff models apartheid as a conflictual regime with the type of inefficiencies we have examined in this paper, whereas under democracy, as the median voter is poor (and mostly black), there is redistribution from the rich (and mostly white) to the poor. Under circumstances that Rosendorff argues were about those prevailing in South Africa around transition time, the losses that the rich whites would incur under democracy were deemed to be lower than those due to conflict, thereby precipitating transition from apartheid.

Acemoglu and Robinson (2000) make a similar argument about the extension of the democratic franchise in Britain during the nineteenth century, albeit using a dynamic model that takes account of an additional possibility: the fact that the ruling elites could have possibly replicated the economic outcome of democracy through systematic transfers and without extending democracy.

However, as Acemoglu and Robinson argue, such transfers are not as credible as those that would come about if the poor were to hold a share of power. That is, extending the democratic franchise represents a level of commitment which, in a changing environment, cannot be credibly replicated by a stream of transfers that are not accompanied by a fundamental change in the rules of the game.

The relative social peace that has followed the extension of the democratic franchise and the variations of the welfare state that are to be found in the developed world appear to have contributed to the political stability that is a prerequisite for modern markets and which, in turn, further fuelled the material growth of the second part of the twentieth century.

8.2 Bureaucracy

New democracies, however, have their own problems of conflict. When a party attains power it often views government as its fiefdom, ready to be exploited just as it was by its former autocratic proprietors. Government positions are staffed by loyal supporters regardless of their qualifications and the positions are used for private gain; government contracts and loans are doled out to individuals and firms within the party's fold; and the power of government is used to weaken political opponents. All this can be perfectly legal as the legal framework is undeveloped. In the meantime, rent-seeking and corruption take place at all levels and actual, bloody conflict can easily take place between government and opposition. The behavior and economic effects of such governments can be more rapacious and short-sighted than those of many dictators. And these are not problems confined to banana republics. The now developed national states of the West have also gone through similar phases during their histories (e.g., Johnson and Libecap, 1994, for the corrupt functioning of the United States civil service in the nineteenth century).

The way Western national states have attempted to tackle these problems and continue to do so can be characterized as attempts to *limiting the discretion* of government officials and agencies. At the higher echelons this is accomplished through systems of checks and balances between the legislative, executive, and judicial branches of government. At the lower levels, discretion is limited through the professionalization of the bureaucracy and the creation of laws, rules, and procedures that attempt to patch the inevitable holes that are created by the evolving economy and society. Bureaucracy becomes professionalized by providing civil servants with security of employment that does not depend on which party is in power, salaries that are adequate to deter corruption for most, and a professional ethic and culture that insulates civil servants for everyday political struggles. Milgrom (1988) and Milgrom and Roberts (1990) have modelled influence activities within organizations and shown how the limiting of discretion, equity in compensation, and other procedures that seem inefficient in a market environment can be efficiency enhancing within organizations. Similarly, using the approach of Warneryd (1998), it can be shown that having more than one level of hierarchy in influence activities and rent-seeking

can increase efficiency.[17]

The ideal disinterested bureaucracy has seldom been attained, of course, and it has many problems of its own, especially when all laws and rules are being applied "by the book." However the relevant comparisons should not be with an unattainable ideal but with the more probable alternative – found in the West's past and in the present of much of the rest of the world – of arbitrary, amateur, and frequently corrupt political control of the levers of government.

By the end of the nineteenth century, the bureaucratic form of organization became the dominant form of organization for private firms as well. Bureaucratization came hand-in-hand with the rise of the corporation as chronicled in Chandler (1977). Though the recent incomplete-contracts approach to the theory of the firm has emphasized the role of relationship-specific investments (Grossman and Hart, 1986), the control of some appropriative activities through the market may well be more difficult than through hierarchies. For example, much of trade across countries, which involves a greater degree of contractual insecurity than trade within countries, is intrafirm trade.[18]vernance

9 Endogenous Security and Governance

In this section I present a simple model in which the degree of security (or governance, or property rights) is endogenized. In line with the discussion of the previous section, we envision a setting in which interested parties can invest in resources that create various checks and balances, laws, courts, and their enforcement (just as the Genoese did with the podesta). I show how the levels of appropriation and conflict, security, and investments in security depend both on (contested) endowments as well as norms (and the degree) of cooperation and on what has occurred in the past.

I continue to consider two organized groups, A and B, each as a unitary actor. Income can be derived from two different types of endowments: One that is contestable and exogenous and another is endogenously generated. Let each group initially posses T units of the contestable endowment and have R units of the secure endowment. Then, in the absence of any conflict or governance costs, the gross value of each group's endowment is:

$$Y_i = T + R \quad \text{where } i = A, B \tag{14}$$

The nature and costliness of fighting over the contestable part of each group's income will be examined in detail next. Broadly, the two groups make the following two sets of decisions:

[17] Max Weber's (1978) classic essay on bureaucracy can still be read with profit, whereas Wilson (1989) offers an excellent survey of the functioning of bureaucracies. Arguments complementary to those being made here have also been advanced using a traditional principal-agent approach (see Tirole, 1994, and Dixit, 1996). Using such an approach, multi-tasking and measurement difficulties lead to the adoption of the low-powered incentives that are typically observed inside bureaucracies.

[18] In the late 90s over 50 percent of US and Japanese trade was intrafirm trade (Gilpin, 2001, p.210).

1. The level of government protection of each group's contestable income is determined by past and current taxation and other decisions.

2. Taken the level of protection as given, each group engages in appropriative activities that determine each group's final allocation and income.

That is, we consider a setting in which both governance and conflict are costly economic activities. We begin with the analysis of the second stage of appropriatio, which is presented in a somewhat more sophisticated fashion – both in terms of modeling and in terms of the type of the environment envisioned – than done in the earlier sections.

9.1 Appropriation

Each group could engage in appropriative activities in order to defend its own contestable income, T, or to challenge that of its adversary. Let a_{ij} denote the level of appropriation that group i engages in relation to the contestable income of group j. Note that if $j = i$, then this is the level of appropriative activity in defending own income and if $j \neq i$, then this is the challenging level of appropriation against $i's$ adversary.

Appropriative activities determine the probability of winning or, equivalently, the share of each contested income[19] in the following fashion:

$$\begin{aligned} p_{ii}(a_{ii,}a_{ij}) &= \frac{\phi a_{ii}^m}{\phi a_{ii}^m + (1-\phi)a_{ij}^m} \ (m \in (0,1]) \\ p_{ij}(a_{ii,}a_{ij}) &= \frac{(1-\phi)a_{ij}^m}{\phi a_{ii}^m + (1-\phi)a_{ij}^m} \ i \neq j \text{ and } \phi \in [\frac{1}{2}, 1] \end{aligned} \tag{15}$$

$p_{ii}(a_{ii,}a_{ij})$ is the share of its contested income the defending group i keeps and $p_{ij}(a_{ii,}a_{ij})$ is the attacker's share of the defender's contested income.[20]

The critical parameter that determines the security of property rights is ϕ. The closer to 1 is ϕ, the more secure the property rights of the defender are, whereas the closer the value of that parameter is to 1/2, the more insecure property rights are with the limiting case of $\phi = 1/2$ being one in which there is no advantage to being a defender relative to the challenger. For our purposes here, we can broadly think of ϕ as being determined by the strength of the courts, the state agencies and bureaucracies, and the political apparatus of the country as a whole. How easy is it for the holder of the (uncertain) property right to argue against the challenger in front of a court, bureaucrats, politicians, or the public at large so as to convince such audiences that the defender is right

[19] Probabilities of winning and shares are equivalent under risk neutrality and divisilibilty of incomes. For exposition purposes, we will employ the share interpretation in the remainder of this paper.

[20] These asymmetric forms ($\phi > 1/2$) have been typically employed in the litigation literature (Hirshleifer and Osborne, 2001). For a development of some properties of the symmetric forms, see Hirhsleifer (1989). For an axiomatization, see Clark and Riis (1998).

In its defense/offense interpretation, this functional form has been used extensively by Herschel Grossman (e.g, Grossman, 2001).

and not the challenger? The closer ϕ is to 1, the easier it is for the defender and the more difficult it is for the challenger to do so.[21] Also, the more professional are the courts and the bureaucracy, and the greater are the checks and balances in politics, the closer would ϕ be to 1.

Another parameter of interest is m. It can be thought of as a measure of the ease or *effectiveness* of producing appropriative effort.[22] Working directly through the political process and the state (the courts, the bureaucracy, or the halls of parliament) would entail a lower m to fighting it out in the streets or even in the court of public opinion.

In this subsection we take ϕ as well as m as given. Given the level of security, the payoff functions of the two groups are the following:

$$V_A^c(a) = \frac{\phi a_{AA}^m}{\phi a_{AA}^m + (1-\phi)a_{AB}^m}T + \frac{(1-\phi)a_{BA}^m}{\phi a_{BB}^m + (1-\phi)a_{BA}^m}T + R - a_{AA} - a_{BA} \quad (16)$$

$$V_B^c(a) = \frac{(1-\phi)a_{AB}^m}{\phi a_{AA}^m + (1-\phi)a_{AB}^m}T + \frac{\phi a_{BB}^m}{\phi a_{BB}^m + (1-\phi)a_{BA}^m}T + R - a_{AB} - a_{BB} \quad (17)$$

where $a = (a_{AA}, a_{BA}, a_{BB}, a_{AB})$ are the strategies of the two groups, one each for defense of own endowment and challenge of the other goup's endowment.

Given the sharing functions and the identical endowments that the two groups have, it can be shown that the (Nash) equilibrium levels of appropriation are identical for defense and challenge and across the two groups:[23]

$$a_{AA}^* = a_{BA}^* = a_{BB}^* = a_{AB}^* = \phi(1-\phi)mT \quad (18)$$

Note that the closer ϕ is to 1 (that is, the better governance is), the lower is the level of appropriation. ($\phi(1-\phi)$ is minimized at 1 reaches its maximum at $\frac{1}{2}$.) Each goups keeps ϕ fraction of its own contested endowment and received a $1-\phi$ fraction of it adversary's contested endowment. Given the level of security, the equilibirum payoff of each group equals:

$$\begin{aligned} V_i^c &\equiv V_i^c(a^*) = \phi T + (1-\phi)T + R - 2\phi(1-\phi)mT \\ &= [1 - 2\phi(1-\phi)m]T + R \\ &= \sigma T + R \text{ where } \sigma \equiv 1 - 2\phi(1-\phi)m \end{aligned} \quad (19)$$

[21] For a derivation of (2) and related functional in such contexts, see Skaperdas and Vaidya (2005).

[22] Note that m is the elasicity of the "impact" function a^m; that is, $m = \frac{\partial a^m}{\partial a} / \frac{a^m}{a}$. Also, Jia (2005) provides a stochastic derivation of contest success function, where the output of each side's effort is stochastic, with m being a parameter that reduces the variability of output as a function of effort (with higher m reducing that variability).

[23] If endowments for the two groups were different, the levels of appropriation would be higher for the endowment that is higher but the levels of the defense and challenge would still be identical.

As can be expected the lower is the level of protection ϕ, the lower is the equilibium payoff of each group. Note how, with security given, changes in the value of the endowment T (for example, by the discovery of new tradeable resources, the exhaustion of old ones, or the change in the international price of existing resources) lead to monotonic changes in appropriation and in equilibrium payoffs. In particular, for fixed levels of security, a reduction in T reduced appropriation and increases equilibrium payoff. We next examine how security can be determined by current and past conditions in stage 1 of the two-stage process we have outlined above.

9.2 Investing in Governance

The level of ϕ (as well as of m) and, therefore, the fraction σ of the contestable endowment that each group eventually keeps would in general depend on the societal and political norms, but more importantly for the case of modern, anonymous property rights on the country's political development and the fiscal choices and organizational decisions that have been made in the past as well as those made in the present. Many of these choices can be expected to depend on the country's characteristics and, as a first approximation, its current conditions can be considered both similar to those in the past and, to the extent that the conditions might have changed, current conditions can be expected to have considerable influence on current governance. In particular, the resources available for paying and training judges, civil servants, or the police can have an immediate impact on the quality of governance and property rights. These resources are largely determined by the taxing ability of the state, which could in turn greatly depend on the ability of the two contending groups to agree on taxation. Past decisions on taxation also have impact on the quality of governance though the educational level of not just government employees but also of others in the country (laywers, politicians, engineers, citizens in general) and through other collective-good investments from court buildings to to university budgets.

Thus, we consider the level of security to be a function of past and present investments on governance so that:

$$\sigma = \sigma(I_o + I_A + I_B) \tag{20}$$

where I_o denotes the inherited investments in governance and I_A and I_B are the current contributions to governance by the two groups. We suppose security is strictly increasing in its argument ($\sigma' > 0$) at a decreasing rate ($\sigma" < 0$).

How the level of governance expenditures – which we suppose to equal total taxes – is determined is of course an important issue. Security here is a public good and in the provision of public goods through taxation, there are two focal regimes: One in which public good provision maximizes total welfare and the other in which its provision is non-cooperative and generally inefficient. We shall examine both types of provision regimes and discuss some of their implications.

The welfare-maximizing choice of governance expenditures solves the following problem:

$$\begin{aligned} & \max_{I_A+I_B} V_A^c + V_B^c - I_A - I_B \\ = \quad & 2\sigma(I_o + I_A + I_B)T + 2R - I_A - I_B \end{aligned} \tag{21}$$

Under the condition that the optimum is interior, or that the inherited level of governance is not too high and there are no liquidity contraints,[24] the welfare-maximizing level of governance expenditures satisfies the following first-order-condition:

$$2\sigma'(I_o + I'_A + I'_B)T - 1 = 0 \tag{22}$$

It is clear that total optimal expenditure $I'_A + I'_B$ can be distributed in many different ways between the two groups (and that in itself can be a source of contention that makes optimal provision difficult to implement). It is clear that $I'_A + I'_B$ is positively related to the value of the contestable resource T and inversely related to the inherited investments in governance I_o.

The non-cooperative contributions to governance are determined as the Nash equilibirum of the game with the following payoff functions:

$$\begin{aligned} V_A(I_A, I_B) &= \sigma(I_o + I_A + I_B)T + R - I_A \\ V_B(I_A, I_B) &= \sigma(I_o + I_A + I_B)T + R - I_B \end{aligned} \tag{23}$$

It is straightforward to show that the equilibrium is characterized by the same condition for both groups (and also results in determining only the total and not the particular distribution of expenditures between the two groups):

$$\sigma'(I_o + I^*_A + I^*_B)T - 1 = 0 \tag{24}$$

As in the case of optimal expenditures, Nash equilibrium expenditures are positively related to T and inversely related to inherited investments in governance I_o. By comparing (26) to (24) and given the strict conavity of $\sigma(\cdot)$, expenditures in governance under the Nash equilibirum are lower than optimal expenditures ($I^*_A + I^*_B < I'_A + I'_B$), for, under Nash equilibrium, each group only cares about its own welfare and no weight is put on the adversary's payoff.

Considering the case of the non-cooperative provision of security, where $\sigma^* \equiv \sigma(I_o + I^*_A + I^*_B)$, and noting that $\alpha^*_{ii} = \phi(1-\phi)mT = \frac{1-\sigma^*}{2}T$, the overall effect of the value of the contestable resource on equilibrium appropriation can be shown to be the following:

$$\frac{\partial a^*_{ii}}{\partial T} = \frac{(\sigma^{*\prime})^2}{2\sigma^{*\prime\prime}} + \frac{1-\sigma^*}{2} \tag{25}$$

[24] In practice, especially for low-income countries, we can expect the liquidity constraints to be more likely to be binding, especially for the case of welfare-maximizing provision.

The first term is negative since $\sigma" < 0$, whereas the second term is positive. The first term is negative because it reflects the effect on appropriation via governance - a reduction in T reduces governance and security and increases appropriation (that is, $\phi(1-\phi)m$ increases as a result of a reduction in governance expenditures). The second effect is positive because it is the direct effect on appropriation that can be seen in (20) – a reduction in T reduces appropriation because the value of the prize that is contested is lower. Overall, the effect of the value of the contestable resurce on equilibrium appropriation is ambiguous. If the governance effect (first term of (27)) dominates the total effect is negative; if the direct, value-of-prize effect dominates the total effect is positive.[25]

Regardless of whether the two groups choose the optimal or non-cooperative levels of governance, the qualitative effects on security and appropriation are similar. Of course, when the choices are non-cooperative the negative effects of a reduction in T are higher on levels of security, on appropriation, and on real income.

However, the level of contested income T might also have an independent effect on the choice of governance expenditures themselves. If, for example, the two groups were to originally have the norm of choosing the optimal level of governance but suddenly face a shortfall in their expected incomes, they might refrain from that optimal level of governance expenditures and decide on a lower level or even the non-cooperative level of governance expenditures. Such a choice might come about because of internal disputes within groups as well as between the groups that are often precipitated by reductions in incomes or other crises. Allowing for a continuous effect of T on the level of cooperation between the groups regarding governance expenditures, we can posit that these expenditures are a convex combination of the optimal and non-cooperative choices:

$$I_i^{\gamma} = \gamma(T)I_i' + (1-\gamma(T))I_i^* \text{ where } \gamma'(\cdot) > 0 \text{ and } i = A, B \tag{26}$$

Then, the total effect on appropriation of changes in T becomes:

$$\frac{\partial a_{ii}^*}{\partial T} = -\frac{\gamma'(T)\sigma^{\gamma'}(I' - I^*)}{2} + \frac{\sigma^{\gamma'}}{2}[\gamma\frac{\hat{\sigma}'}{\hat{\sigma}"} + (1-\gamma)\frac{\sigma^{*\prime}}{\sigma^{*}"}] + \frac{1-\sigma^{\gamma}}{2} \tag{27}$$

where $\sigma^{\gamma} \equiv \sigma(I_o + I_A^{\gamma} + I_B^{\gamma}), I' \equiv I_A' + I_B', I^* \equiv I_A^* + I_B^*$, and $\hat{\sigma} \equiv \sigma(I_o + I_A' + I_B')$.

[25] It appears that (27) is negative when the function $\sigma(\cdot)$ is sufficiently concave. To see that, note that (12) is negative when

$$\frac{(\sigma^{*\prime})^2}{\sigma^{*}"} + 1 - \sigma^* < 0$$

or when

$$-\frac{\sigma^{*}"}{\sigma^{*\prime}} > \frac{\sigma^{*\prime}}{1-\sigma^*}$$

which occurs when $-\frac{\sigma^{*}"}{\sigma^{*\prime}}$ is large enough, or, when σ is suffiiciently concave.

The last two terms of (29) are qualitatively similar to those of the two terms in (27). The first term in (29) is new and is due to the change in the level of governance choices induced by a change in T; that effect is negative since $\gamma'(T) > 0, \sigma^{\gamma'} > 0$, and $I' > I^*$. Recapitulating, a reduction in the value of the contested resource T has three effects:

(i) a tendency to reduce appropriation because the value of the contestable resource is reduced (represented by third term in (29);

(ii) a tendency to increase appropriation because it reduces the governance expenditures and security (represented by second term in (29));

(iii) a tendency to increase appropriation because it reduces the degree of cooperation on the choice of governance expenditures between the groups (represented by the first term in (29)).

Of course, the opposite effects are present on the real final income of the groups. In addition, each group's income is reduced directly since T is part of income, but which is counterbalanced by the reduction in governance expenditures as a result of a reduction in T. Final real income for each group is:

$$Y_i^r = \sigma(I^\gamma(T))T + R - I_i^\gamma(T) \tag{28}$$

Some of the various results can be summarized as follows:

1. A reduction in the contested endowment T reduces governance expenditures and the level of security (that is, $\phi(1-\phi)m$ increases).

2. A reduction in the contested endowment T has ambiguous effects on the level of appropriation. The direct strategic effect is to reduce appropriation,but the indirect effect of reduced insecurity is to increase appropriation. Appropriation is more likely to increase if there is a reduction in cooperation in the choice of governance expenditures and the non-cooperative expenditures become more likely.

3. A reduction in the contested endowment T unambiguously reduces income, directly and indirectly through the reduction in security and possibly through the increase in appropriation.

It is important to note, though, that levels of appropriation, security, investments in security, and welfare depend not just on endownments but also on the norms of cooperation between the interested parties. History is often a large determinant of such norms. History is also important because institutions and governance can not be built within a short period of time, something that I have ignored here by focusing on interior equilibria.

10 Concluding Remarks

- Conflict and appropriation empirically significant
- Incorporation of Conflict and appopriation leads to very different results from those in Nirvana models.

- Nirvana implausible as a guide to understanding the world.
- Governance as a costly economic activity.

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