

METAPOLITICAL EXPLORATIONS

by

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A Dissertation
Submitted to the
Graduate Faculty
of
George Mason University
in Partial Fulfillment of
The Requirements for the Degree
of
Doctor of Philosophy
Economics

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Date: _____ Fall Semester 2016
George Mason University
Fairfax, VA

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DEDICATION

For Stephanie, my beloved and patient wife.

ACKNOWLEDGEMENTS

George Mason University has a unique collection of the world's most eccentric and fascinating economists. I am grateful to have been a part of such a singularly interesting Department—this dissertation could not have been written anywhere else. Alas, they do make you leave at some point. Although departmental change is inevitable and healthy, I hope it never loses its charm. Keep GMU Econ weird.

The Mercatus Center has not only been a source of income for the past several years, but also one of camaraderie. I thank my colleagues for their consistent support for this project, and for putting up with my sudden disappearances to the coffee shop to write. I look forward to the work ahead of us.

Everybody knows that Tyler Cowen has an exceptional mind. It was on full display in the incisive comments he sent me on the many drafts of these essays. I am grateful to Tyler not only for the substantive feedback and guidance he contributed, which greatly improved the final product, but also for his superhuman ability to evaluate half-wrought ideas in an open-minded, egoless manner. I continue to be inspired by his example of scholarship in this respect. Any shortcomings in what follows are mine, not his.

I have been encouraged in my efforts by many friends and relatives—I am fortunate to have them in my life. Most of all, I thank my wife, Stephanie, and my children, Rhys and Juliana. Their companionship is my greatest joy. And without joy in life, what use is any of this?

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ABSTRACT

METAPOLITICAL EXPLORATIONS

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George Mason University, 2016

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What constrains the state? These essays explore different aspects of this question.

Chapter 1 focuses on the empirical finding that democracies and autocracies have similar policies. To explain this counterintuitive fact, I develop a model in which there is a more fundamental constraint than that embedded in the rules of politics. The predictions of the model with respect to the degree of constraint match well with the institutional economics literature. The model can therefore add needed structure to existing institutional theories.

Chapter 2 examines the role of technology in constraining the state. As technology has advanced, so has the size and power of the sovereign state. Yet technology is often seen as undermining state power. This essay reconciles these observations with a theory of multidimensionality—some technologies simply increase output while others increase resistance to expropriation. I show that these characteristics appear to affect the degree of expropriation, which in turn affects the degree of investment in resistance to expropriation. Finally, can the state be constrained from forming in the first place?

Chapter 3 focuses on this question with respect to the literature on market anarchy.

Previous work on market anarchy has focused on the costs of cooperation, which is a double-edged sword, allowing both the production of public goods as well as collusion between protection firms. Using the constraints developed in the first two chapters, I argue that the benefits of cooperation are both limited and must be taken into account.

Market anarchy is stable when both constraints bind severely. While this condition does not describe contemporary society, it has prevailed in specific times and places and could reappear in the future.

A THEORY OF METAPOLITICS

One of the most surprising findings in political economy is that democracies and dictatorships have similar economic and social policies. Using the POLITY IV dataset, Mulligan, Gil, and Sala-i-Martin (2004) test for systematic policy differences between governments along the democracy spectrum. Controlling for economic and demographic variables, they find that governments have similar welfare and education spending policies regardless of their degree of democratization. The only economic policy that represents a statistically significant difference is that democracies have flatter personal income tax rates than nondemocracies.¹

This finding contradicts common intuitions about the differences between democracy and dictatorship. Many economists assume that the form of government is a question of great significance. Formal voting power ought to correspond to control over policy, and a democratic majority should be expected to self-interestedly use this power differently than a dictator. Olson (1993) explicitly predicts that democracies will have

¹ Ross (2006) has a variant on this finding. He argues that although democracies spend more on social services than nondemocracies, outcomes for the poor—particularly infant and child mortality—are no different. In other words, although spending sometimes differs, the quantity of public goods actually produced varies little between democracies and nondemocracies.

lower tax collections than autocracies for this reason.² Meltzer and Richard (1981), Niskanen (1997), and Acemoglu and Robinson (2005) also have models in which democracies provide more public goods and engage in more income redistribution than nondemocracies.³

What explains this counterintuitive result?⁴ In this chapter, I contend that there must be a deeper constraint on the state than that embedded in the rules of politics. I develop a theory of metapolitics—the competition for power in the state of nature. First, I show that under certain assumptions the competition for power has no core. The state of nature is characterized by constantly shifting coalitions of expropriation.

Second, I add public goods to the model. In the augmented model, there is still competition to be in the dominant coalition, but the competition for power takes a political, rather than a directly violent form. All members of the dominant coalition prefer to moderate their expropriation rather than risk destabilizing the political order—the government is metapolitically constrained. An implication is that the coalition has an

² “Though both the [democratic] majority and the autocrat have an encompassing interest in the society because they control tax collections, the majority in addition earns a significant share of the market income of the society, and this gives it a more encompassing interest in the productivity of the society.” (Olson, 1993, p. 570).

³ Not every political economist assumes democracies and nondemocracies have different policies. Mises (1998 [1949]) believed in what Caplan (2008) calls a “democracy-dictatorship equivalence theorem.” Machiavelli (2015 [1532], Chapter XIX), also believed dictators are sensitive to popular support.

⁴ Another finding in the literature is that institutional quality is primarily a function of income. For example, Glaeser, La Porta, Lopez-de-Silanes, and Shleifer (2004) find that poor countries get out of poverty through good policies, often pursued by dictators, and then improve their institutions. Thus, democracies in poor countries may perform poorly relative to wealthy democracies because they have low-quality institutions. Yet this finding doesn’t explain why, for a given level of income, a change from nondemocracy to democracy should make no difference for policy.

incentive to maximize the social value of the public goods it produces, regardless of political form.

Finally, I explore some of the frictions that might prevent the metapolitical bargaining that causes coalitions to cycle in the first place. When these frictions are severe, the metapolitical constraint does not hold. States can expropriate without limit, constrained only by the size of the tax base.

This framework has considerable advantages. In addition to generating similar policies for metapolitically-constrained democracies and nondemocracies, it offers a way of operationalizing and demystifying institutional approaches to political economy. In addition to explaining the ways in which democracies and autocracies are similar, it can illuminate how they are different. By positing specific frictions and mechanisms that affect the degree to which states are metapolitically constrained, this chapter is a step toward more precision and structure in institutional economics.

Social Conflict under Zero Metapolitical Transaction Costs

Cycling is a deep feature of politics that shows up in a variety of models and contexts. The Marquis de Condorcet noted in the 18th century that collective preferences, as expressed in voting, are sometimes non-transitive. Arrow (1950) generalized this observation. Voting models that allow complete majority rule, the formation of coalitions, and the sale of votes have no core (Becker, 1983, p. 393). A similar problem plagues ruling coalitions in dictatorships (Tullock, 1987, p. 19).

Theorists have adopted a number of techniques to resolve the ambiguity created by cycling. Plott and Levine (1978) emphasize that when collective preferences are non-

transitive, outcomes can be manipulated through agenda control. Aumann and Kurz (1977) solve their cooperative voting game by allowing players to destroy their own wealth rather than have it expropriated (i.e., a no-slavery condition). Telser (1982) generates a core only by assuming that the majority must pay for a proportional share of what they vote for.

In the state of nature, however, these solution concepts won't do. There is no fixed agenda controller, nor are there constitutional limitations that bound expropriation or stipulate a fair division of costs. If the state of nature, like the political world, is prone to cycling, then a new solution concept is needed to explain how that cycling is in fact resolved.

Consider a state of nature in which powerful groups expropriate resources from weaker groups. It is well known that weaker groups can respond by acquiescing or fighting back.⁵ A third strategy, the one I explore for the remainder of this chapter, is to bargain. Individuals in the weaker group can pay members of the dominant group to defect. This makes sense for both parties as long as the payment is less than the weaker group was paying and more than the defecting members were receiving in expropriation.

Let aggregate power in a society with a fixed population be normalized to 1. Individuals each possess some small fraction of aggregate power, so that the power of

⁵ Acquiescing results in a guaranteed negative payout, and fighting back under any model of conflict results in an expected negative payout since by assumption the player is part of a weaker group.

any group equals the sum of the power of its members.⁶ Let $\frac{1}{2} < n < 1$ be the fraction of aggregate power held by the dominant group, which I will also call the in-group. Because n is greater than the power held by the rest of society (the out-group), the dominant group can expropriate from the rest of society without limit. Let x be the amount of expropriation, which takes the form of a lump-sum transfer.⁷

To be maximally resistant to bargains initiated by members of the out-group, the in-group will distribute the expropriated resources so that each in-group unit of power receives $\frac{x}{n}$; each out-group unit of power pays $\frac{x}{1-n}$. Despite this maximally resistant structure of payments and payouts, every out-group member has an incentive to bid to receive less than $\frac{x}{n}$ per unit of power if they are allowed into the in-group, since any positive payoff is better than the negative payoff earned by the out-group. Every in-group member has the incentive to accept such a bid and expel some other member who is receiving at least $\frac{x}{n}$ per unit of power. This game has no core; the composition of the

⁶ There is no need to assume that each individual possesses the same fraction of aggregate power. By specifying a relatively concentrated distribution of power, one can locate the source of metapolitical competition in a relatively small group, consistent with Tullock's (1987) observation that military coups are much more common than popular revolutions.

⁷ The assumption of limitless lump-sum transfers simplifies the mathematics of the model, but it also abstracts from limitations on the technology of control, discussed in the next chapter. There is broad agreement that these limitations constrain the state; the Laffer curve exists because governments cannot literally force their subjects to work equally hard under all rates of taxation. Because the model abstracts from these limitations, constraints on power that emerge are not attributable to technological or supply-side factors.

dominant group will cycle indefinitely if there are no barriers to exchanging power for income. Because the game is zero-sum, participants receive a Shapley value of 0.

I assume that these power-for-income bargains, which I call metapolitical transactions, are exchanges of flows, not stocks. Expropriation is an ongoing activity of the dominant group; it produces a rent that can be said to accrue in continuous time. Likewise, the power that each of the members of the dominant group wields on the group's behalf operates in continuous time. The power can be withdrawn if members do not receive their agreed-upon share of the expropriated resources, and the income from the expropriated resources can be withheld if members do not supply power to the group. Consequently, metapolitical transactions do not suffer from commitment problems; they are equivalent to spot exchanges.

I further assume that agreements to keep members in the dominant group even if their power is no longer needed—for example, if a new member can supply power more cheaply—are not enforceable. Unlike the metapolitical transactions described above, these commitments cannot be described as spot exchanges. They require non-Nash play in a future subgame, in which the dominant group faces a choice to buy power at either a high or low price. The agreements unravel and have no influence on the equilibrium or lack thereof.

The perpetual cycling that occurs in this state of nature is difficult to interpret. It suggests that at some deep level the social order is indeterminate. In the absence of metapolitical transaction costs, pure theories of social conflict can do little to explain

political outcomes. A useful theory must explore partially cooperative rather than purely conflictual social equilibria or search for sources of metapolitical transaction costs.

Solving the Cycling Problem with Public Goods

One way to avoid perpetual cycling is for the dominant group to produce public goods,⁸ for which it extracts payment by force if necessary.⁹ The exact mechanism by which the public goods are bootstrapped into existence are not important for my analysis; Cowen and Kavka (2003) discuss several ways that a public goods-producing government could arise in the state of nature. If the social value of the public goods produced by the dominant group exceeds the cost of their production, this will generate a rent. There will be social competition for the value of the rent, just as there was competition in the state of nature to capture the value of private production.

In contrast with the competition in the state of nature, this competition is subject to two new constraints. First, the competition must not seriously disrupt the production of public goods and the generation of the rent. The competition takes a political, rather than a directly violent form. Second, as a result of the need to keep the competition at the political level, the dominant coalition is strictly limited in the amount it can expropriate.

⁸ A classical pure public good is one that is nonexcludable and nonrivalrous. I use the term public good to denote a good that has positive externalities (is at least somewhat nonexcludable) and faces increasing returns to scale in production (is at least somewhat nonrivalrous).

⁹ There is a rich and growing literature on the private provision of public goods, which does not rely on the threat of force to extract payment. For this paper, I set aside this possibility in order to focus on the constraints faced by governments, which do threaten to use force. It should nevertheless be borne in mind that non-governmental equilibria are not ruled out by my paradigm. If an anarchy can produce public goods, then it could be a solution to metapolitical cycling.

If expropriation exceeds this amount, it will be rational for the out-group to use metapolitical transactions to induce some members of the dominant coalition to defect, even if production of public goods is disrupted. Under either of two further assumptions, the amount of net expropriation must be zero.

As in the last section, let n be the fraction of aggregate power held by the dominant group, and let x be the amount of lump-sum expropriation in excess of the subjective value of the public goods transferred from the out-group to the in-group. Let s be the social surplus generated by the public goods produced by the dominant group. The out-group will choose to disrupt the production of public goods through violence if the cost of accumulating the power to do so is less than the benefits in terms of no longer having to make a payment to the dominant group. That is, they will disrupt the political order if

$$x > \left(n - \frac{1}{2}\right) \frac{s + x}{n}.$$

The term on the left of the inequality is the expropriated transfer to the dominant group. The term on the right is the cost of inducing $n - \frac{1}{2}$ units of power to revolt. Since the in-group has captured all of the social surplus s and receives the expropriated payment x from the out-group, to be maximally resistant to a violent revolution using power accumulated through metapolitical transactions, each unit of power in the in-group receives $\frac{s+x}{n}$. The expression can be simplified to

$$x > s(2n - 1).$$

Therefore, the dominant group faces a choice of x and n in an attempt to maximize $\frac{s+x}{n}$ subject to the revolution constraint of $x = s(2n - 1)$. Plugging in the maximum value of x from the constraint into the maximand, the problem now is to select n to maximize

$$\frac{s + s(2n - 1)}{n},$$

which simplifies to $2s$ per unit of in-group power. This value is invariant to n , which indicates that the payout per unit of power is invariant to the size of the dominant group.

Since we assume that the in-group will expropriate the maximum possible amount subject to the revolution constraint, the out-group will collectively be forced to pay $s(2n - 1)$. Divided over the out-group size of $1 - n$, the out-group receives $s \frac{1-2n}{1-n}$ per unit of power.

Without any further assumptions, we have established that there is a limit on expropriation in the game augmented with public goods. As n ranges from $\frac{1}{2}$ to 1, x varies linearly from 0 to s . This constraint exists despite the fact that we have assumed unlimited technical capability to expropriate. In addition, since each in-group unit of power receives a payoff proportional to s , the in-group has an incentive to strictly maximize the value of s .

We can calculate the Shapley value of the game augmented with public goods. Without any other frictions, an agent has probability n of being in the in-group and probability $1 - n$ of being in the out-group. Consequently, the agent receives an expected payoff of $2sn + (1 - n)s \frac{1-2n}{1-n}$ per unit of power, which simplifies to s . Since this value

is higher than the Shapley value of the game without public goods, behind a veil of uncertainty the agent prefers the state of the world with public goods.

This preference, combined with the fact that it is rational to preserve the public goods outcome by limiting expropriation, is sufficient for our purposes to conclude that a partially cooperative political system will form and be stable. The game still has no core, but the competition to be a part of the dominant coalition must now take place within the political system in a way that does not disrupt the production of public goods.

Although there is still an infinity of possible outcomes, some of them are particularly notable. First, consider the outcome where $n = \frac{1}{2}(+\varepsilon)$ and $x = 0$. In this situation, the dominant group still gains a payoff of $2s$ per unit of power, and every player at least weakly prefers the public goods game to the state of nature, which has an expected payoff of 0. Until now, we have assumed that taxation and expropriation are lump-sum transfers with zero deadweight loss. The slightest relaxation of this assumption will make this outcome strictly optimal for the dominant coalition.

Second, because competition for power must now take place within the political system, outcomes in which $n < \frac{1}{2}$ may be possible. For example, each player could get their Shapley value, s per unit of power. Alternatively, a small coalition could divide up the social surplus among themselves and give the remainder of the population 0 (or ε) per unit of power so that they weakly (strictly) prefer the political outcome to the state of nature. Indeed, the incentive for the in-group to engineer the political system to allow

$n < \frac{1}{2}$ is strong; if they can get away with giving 0 to the out-group, they can earn $\frac{s}{n}$ per unit of power, which is greater than $2s$ when $n < \frac{1}{2}$.¹⁰

To summarize the results of the game, when metapolitical transaction costs are zero, the most powerful group of self-interested agents will optimally produce public goods. In addition, although they are assumed to be capable of unlimited expropriation, they are constrained in their expropriation by the dynamics of the game. Under the weakest set of assumptions, the total amount of net expropriation will fall in a range between 0 and s . Under stronger but plausible assumptions that either 1) deadweight loss of expropriation is not zero or 2) the political system will allow $n < \frac{1}{2}$, expropriation is strictly zero.

Sources of Metapolitical Transaction Costs

The model above describes one possible explanation for the stylized fact that democracies and autocracies have similar economic and social policies. Whereas existing models comparing democracy and dictatorship emphasize differences in formal control over the policy apparatus of the state, my model emphasizes that governments of either type could be more fundamentally constrained in a way that is invariant to the form of government. When this constraint binds, a move from dictatorship to democracy or vice versa should have little effect on policy.

¹⁰ If we assume that different members of the out-group can receive different payoffs per unit of power, then the metapolitical constraint is that the bottom half of the power distribution receives at least 0 on average.

Perhaps the least plausible element of the model, if taken literally, is the result that governments maximize social welfare. While governments in rich countries clearly produce higher welfare than the state of nature, it is not very difficult to look around and see instances in which policies are suboptimal. I resolve this problem in two steps.

First, my claims of efficiency operate purely at the metapolitical level. *Political* systems can dissipate some of that efficiency through well-known public choice channels. Even if that occurs, if the vast majority of people are receiving non-negative surplus from public goods, they will tolerate some inefficiency of government without overthrowing it. They are better off working within the political system to improve efficiency.

Second, the assumption of literally zero frictions in the market for power is not meant to be descriptive. For some countries, it may represent a decent first approximation. For others, it is far from the truth. A strong implication of the model is that differences in these metapolitical transaction costs across countries should explain differences in the constraints faced by different governments. When these transaction costs are low, the government faces a strict constraint to basically produce public goods and tax with restraint. When they are high, the government faces few metapolitical constraints; it can neglect public goods production and punitively expropriate.

A focus on differences in metapolitical transaction costs can therefore give structure to existing research on the importance of institutions in political economy. North (1991, p. 97) defines institutions as “the humanly devised constraints that structure political, economic and social interaction.” It is evident that institutions matter, but how and why are not so clear. If institutions are humanly devised, and if the state is capable of

coercing humans, how can institutions ever constrain the state? What determines and constrains institutions?

If my model is correct, at least part of the variation in the observed quality of institutions must be explained by factors that affect metapolitical transaction costs. The sources of these metapolitical transaction costs, therefore, are of some importance, and it is to this subject that I now turn. Some of these sources are purely exogenous. Others are partially endogenous, at least over the long run; in that sense, my theory is not perfectly fundamental. Yet by positing a specific mechanism by which these factors constrain governments, we can approach a more structural theory of why some governments are worse than others.

Group Identity

Both the cycling in the first version of the model and the constraint on the state in the second version emerge from the fact that agents care only about their income. They have no qualms about defecting or inducing defection from the in-group in exchange for payment. The market for power is frictionless.

In the real world, group identity can represent a significant barrier to such seamless exchange. If in-groups and out-groups are composed of members who have an external basis, beyond self-interest or common circumstances, for identifying with each other, group members may refuse to make transactions that would cause them to switch groups or to remove group members. Ethnic or linguistic characteristics could form such a basis.

A certain level of group identity and animosity seems to be exogenous and inevitable.¹¹ In addition to this seemingly hard-wired predisposition to form strong group identities, group identity can be cultivated over time by a government intent on doing so. There is significant empirical evidence that both exogenous and endogenous group identification matters for the quality of government and economic outcomes.

Easterly and Levine (1997) use a Soviet dataset on ethnic diversity to test the effect of fragmentation on public policies and growth in Sub-Saharan Africa. They find that ethnic and linguistic fragmentation explains a significant part of Africa's poor political and economic outcomes. Fragmentation is negatively correlated not only with low growth, but also with many plausible inputs to growth, including schooling, quality of financial systems, free foreign exchange markets, and infrastructure. A large portion of Sub-Saharan Africa's poor economic outcomes may be due to the fact that its political borders were drawn without regard to ethnic groups.

Alesina, Devleeschauwer, Easterly, Kurlat, and Wacziarg (2003) build on Easterly and Levine's work by developing a new and larger dataset on ethnic, linguistic, and religious fractionalization for 190 countries. They find an even stronger effect of ethnic fractionalization on growth using this wider and more recent sample. The authors also note that their new measures of fractionalization significantly correlate with other variables used to explain the quality of government, such as legal origins and latitude. It

¹¹ Theoretical biologists have proved that the same gene-centered view of evolution that is necessary to explain altruism also entails what is known, after Hamilton (1970), as Hamiltonian spite. Evolved organisms will harm themselves if in so doing they can increase the survival rate of their genes. This can include attacking sufficiently unrelated organisms if it increases the survival rate of related organisms.

is difficult to disentangle causality between these competing explanations, but as there is a stronger theoretical basis for believing that fractionalization affects growth and institutions than, e.g., latitude per se, there is a case for regarding fractionalization as more fundamental.

Negative effects of fractionalization do not just exist in cross-country comparisons or in the development literature. Despite overwhelmingly positive long-run effects of immigration, across US metropolitan areas, Putnam (2007) finds that ethnic diversity within census tracts leads to lower levels of social trust, including in members of one's own race. This extends to lower confidence in local government, lower levels of political engagement, lower expectations of cooperation from neighbors, and lower happiness. Because this effect takes place at the level of census tracts, and local governments are not usually subject to violent revolutions, my claim is not that my model applies within US metropolitan areas, but rather that the diversity-anomie link Putnam documents may also extend to national polities.

A number of real-world regimes have been able to engage in expropriation seemingly because of differences in ethnic or racial characteristics. Obvious examples include European colonization of indigenous peoples, American slavery, and South African apartheid. When these differences don't exist organically, regimes have found it worthwhile to create them.

In Rwanda in the mid-twentieth century, Belgian colonists issued identification cards that identified the natives as Hutu, Tutsi, or Twa, elevating the importance of the strictly social distinction between Hutus and Tutsis. By the end of Belgian rule, the

distinction had led to more antagonistic and coercive relations between the groups. This division was one of several factors that led to the 1994 genocide. After the genocide, the Rwandese government banned reference to these groups in public discourse; over the long run, it's possible that such a ban could realign identities.

North Korea is ethnically homogenous. Yet *The Economist* (2011) reports that North Korea's government classifies its subjects into 51 social categories, and isolates those groups who are disloyal to the regime. This behavior is consistent with the theory presented above; when segments of society are isolated or distrustful of each other, they are less likely to be able to gang up against the regime and threaten it. Therefore, the regime can punitively expropriate, as we in fact observe in North Korea.

Ideology

A second source of frictions in the market for power in the state of nature may be intrinsic motivation, as perhaps afforded by ideology. If in-group members are true believers in some cause, then to the extent that political conflict can be cast in terms of that cause, they will resist metapolitical transactions that undermine it. As a result, a state built on an ideological movement will have greater ability to expropriate from the out-group than otherwise.

There is considerable evidence that Communist regimes in particular were highly expropriative. Courtois (1999) estimates the 20th-century death toll of Communism at 94 million, with most of the carnage originating in China and the Soviet Union. While perhaps not every member of the ruling party in these countries was a true believer, at least in the early years of Communist rule, many were. My theory suggests that this

devotion to ideology could have insulated these regimes from induced defection. As belief in Communism eroded, the USSR collapsed and China liberalized.

Mulligan et al. (2004) also supply evidence that Communist regimes are different from non-Communist dictatorships. Out of a sample of over 100 countries, Communist regimes engaged in significantly more social spending than non-Communist regimes. They collected an additional 9 percentage points of GDP in revenue, much of it from government enterprises. The authors find no statistically significant difference in government revenue or social spending between democracies and non-Communist dictatorships.

To a considerable extent, ideology is part of the zeitgeist, a spontaneous order. It is therefore a somewhat exogenous factor. However, through various propaganda mechanisms such as state television and public schools, governments can influence ideology over time, sometimes substantially.

There is evidence that governments, and particularly autocracies, control the media in many countries. Djankov, McLiesh, Nenova, and Shleifer (2003) look at patterns of media ownership in 93 countries. Globally, governments own 60 percent of television stations and 72 percent of the top radio stations. Seventy-one percent of African governments have monopolies on broadcast television, as do all countries in the Middle East aside from Israel. State ownership of media is significantly correlated with autocracy. Based on this and other evidence, the authors reject the possibility that state ownership of media is in the public interest; rather, their results support the view that state ownership is intended to control information flows to the public.

State-run education is another avenue for propaganda. Lott (1999) finds that totalitarian regimes spend more resources on public education than free-market democracies.¹² The pattern of public education spending, which can serve an indoctrination purpose, is similar to that of state-owned television stations, yet dissimilar to that of health care spending, which does not help to indoctrinate. Totalitarian regimes are also associated with higher female labor force participation and lower ages of starting school, evidence that they prefer to play a stronger role in the transmission of values relative to families.

External Enforcement

A third source of transaction costs is outside enforcement. The model assumes that all of the relevant actors are part of the fixed population that live under the government that forms to provide public goods. In reality, this is not always the case. When a powerful external agent selects a coalition to support no matter what, that coalition will be able to govern and exploit with impunity because expropriated members of the population do not have access to negotiations with the external agent.

Patron-client relations between states have been common throughout history. During the Cold War, both superpowers had a network of client states as allies. In many cases, the governments of the client states needed the support of their patron to remain in power.

¹² Unlike Mulligan et al. (2004), Lott does not control for Communism. Mulligan et al. find that democracy makes no statistically significant difference for education spending, and that Communist regimes spend significantly more on education.

As already discussed, Mulligan et al. (2004) find a significant effect of Communism on government revenue and social spending. While I have argued that some of this effect may be due to ideology reducing willingness to bargain for power, that explanation makes the most sense in the early days of the Soviet Union and the People's Republic of China. High levels of tyranny in Soviet satellite states may be better explained by the fact that the populace was not bargaining among itself for control of the dominant coalition. Rather, the dominant coalition was selected externally and propped up against any possible domestic uprisings until the late 1980s.

To some extent, the same dynamic was and is true of American client states as well. McKoy and Miller (2012) note a dilemma facing a democratic patron state: on one hand, it may have an ideational preference for democracy in its client state, but on the other hand, democracy entails some uncertainty that the government of the client state will continue the alliance. A democratic patron may prefer to support an autocratic regime with which a continuing relationship is assured rather than risk the putting the relationship in the hands of a democratic movement.

McKoy and Miller count 11 American client states that faced popular democratic movements between 1970 and 1988. The United States supported democratization in only 4 of those instances. In 3 of the 4, a transition to democracy occurred, whereas democracy occurred in only 1 of the 7 client states in which the United States did not support democracy.¹³ It therefore seems clear that patron state support is correlated with

¹³ During this period, there were also 14 democratizations among American client states which were not preceded by a significant popular democratization movement.

whether popularly supported reforms are successful, which is precisely what the theory predicts.

Since the end of the Cold War, client states have diminished in importance. Today, only North Korea is a clear-cut example of a client state, with China as its patron. It is worth noting that the North Korean regime is one of the world's most repressive, consistent with the theory that external support enables high levels of expropriation. If Chinese support were to be withdrawn, in the absence of other frictions in the market for power, the theory predicts that North Korea would be forced to switch to a less exploitative equilibrium based on public goods.

Other forms of external support come from more multilateral arrangements. The African Union and its predecessor, the Organization for African Unity, have been called a "dictators' club." Omorogbe (2011) notes that in 1997, the OAU adopted a policy of not recognizing governments that came to power through coups. In some cases, as in Mauritania in 2005 and 2008, as well as in Niger in 2010, this has meant that the AU has refused to recognize governments with overwhelming popular support. In other words, the AU's policy not to recognize governments established in coups can be a form of collusion between incumbent governments trying to limit competition for power. Omorogbe recommends that the AU change its policy to a more nuanced one recognizing that some coups have popular support.

Internal Policing

A final factor that can impede bargains for power among a population is internal policing performed by the incumbent government. The existence of mass surveillance or

a secret police force can substantially raise metapolitical transaction costs. If subjects of a regime wish to overthrow it, it is useful to be able to discuss the bargains that might be made. If the secret police prevent these discussions from happening, regime overthrow will become more difficult.

There is evidence that such policing is correlated with autocracy. Mulligan et al. (2004) find that policies associated with barriers to political entry are those that most differ between democracies and autocracies. Autocracies are statistically more likely to practice widespread torture, have the death penalty, spend more on the military, afford fewer civil liberties, and regulate religion. Of course, even democracies do some policing against overthrow; the prosecution of treason is pursued in most countries.

Of the sources of metapolitical transaction costs that I discuss, internal policing is the most endogenous. If internal policing is available to a government, they would be expected to engage in it. However, there are at least two reasons why regimes might not implement such policing, or fail to do so to the maximum extent. First, it can be difficult to create a secret police force because such a force is not something that is desired by the public, whose opinion by assumption constrains the state in the absence of other metapolitical transaction costs. When forward-looking subjects observe the creation of such a force, that can signal that it is time to remove the perpetrators from power whether through voting or overthrow.

Second, a secret police force can be difficult to control. If it becomes too powerful, it could seize power in a coup. A government subject to low metapolitical transaction costs may reason that the status quo is better than higher barriers to political

competition combined with a higher risk of overthrow. Another way to put this is that secret police may themselves become parties to metapolitical transactions.

For evidence of limited control over the secret police, we need only look to the fall of communism. A number of states with secret police forces in central and eastern Europe were relatively peacefully overthrown in 1989. It seems clear that secret police can prevent particular discussions of metapolitical transactions from occurring, but they cannot prevent the more tacit transactions that might occur following a mass protest (*cf.* Kuran, 1989). During such a protest, the police force may sense that the regime is on the verge of overthrow and refuse to do its duty.

Conclusion

The stylized facts of comparative political economy contradict a number of well-cited models in the literature. These models assume that rational autocrats expropriate more heavily than democracies and provide fewer public goods. In reality, democracies and autocracies vary less in economic and social policy than these models suggest.

To reconcile these stylized facts with rational choice, I put the competition for power front and center. In my model, autocrats are constrained by the competition for power, and consequently, they limit their expropriation. Under strong assumptions, the government maximizes the value of public goods, it ensures that all members of society receive non-negative value from public goods net of taxation, and politics merely divides the surplus from public goods among different members of society. This result is not unlike what would be expected to occur in a well-functioning constitutional democracy, but it does not depend on that particular form of government.

At the same time, a focus on the competition for power outside of the political system can help to illuminate why some dictatorships are highly expropriative, as well as why democracies and autocracies differ in non-economic respects. Factors that interfere with metapolitical competition result in outcomes similar to those predicted by models that don't consider competition in the first place—higher levels of taxation net of public goods for autocracies than democracies. And insofar as these factors are endogenous, it is unsurprising that autocrats pursue them. We can model autocrats as lexicographically preferring staying in power over additional wealth.

A key policy implication of the model is that economic development would be aided by focusing more heavily on barriers to the competition for power. It is well known that borders in Sub-Saharan Africa were drawn without regard to ethnic or linguistic unity. Perhaps more effort should be put into remedying this error. Reducing state-originated indoctrination and external support for incumbent regimes should also be priorities. Supposedly humanitarian policies of propping up weak states in particular should be revisited.

More generally, the model suggests that barriers to metapolitical competition form a significant part of the basis of variation in institutional quality. Factors that limit such competition empirically correlate with inferior outcomes and repressive governance. Both theory and evidence, therefore, suggest that prioritizing metapolitical competition is a promising way of advancing institutional economics.

TECHNOLOGIES OF CONTROL AND RESISTANCE

“Liberty consists in the division of power. Absolutism, in concentration of power.” — Lord Acton

Technology enables everyone to do more with less. Both individuals and large groups expand their objective production possibilities when new technology is invented or discovered. But the fact that technology is broadly empowering tells us little about the *relative* shifts in power that accompany technological change. Does a particular invention increase the capacity of an individual or small group to resist the will of the masses? Or does the new technology allow large organizations to better regulate the behavior of rogue individuals? Technology is unlikely to be fully neutral between these two possibilities, and therefore it is likely to affect political equilibria. Yet the role of technological change has been largely ignored in political economy.

A significant exception to this neglect is Cowen (2009), who attributes the increase in the size of government over the course of the 20th century to technological change. A century ago, U.S. federal government spending was 2 percent of GDP, and the regulatory burden was minimal. Today, federal spending approaches a quarter of GDP, and the regulatory burden is so high that it is difficult to think of a sector of the economy that is exempt from government meddling. This change is not attributable to ideology or

to political reform—changes in the climate of opinion, after all, mostly reflect movements in other variables, and the growth of government occurs too simultaneously across Western countries to be explained by reforms such as franchise expansions.

Instead, Cowen focuses his explanation on changes in technology. Quite simply, the modern administrative state needs relatively advanced communication, transportation, and organizational technologies if it is to intervene in the daily lives of its subjects. Without these, it is impossible to coordinate across vast expanses or apply consistent policy to millions of subjects. Furthermore, as Cowen notes, 20th-century technologies of production—factories, power plants, and so on—are large, valuable, and immobile, and therefore relatively easy to tax and regulate.¹⁴ For most of the 20th century, therefore, technology was a force for the growth of ever more intrusive government.

On the other hand, the idea that technology is a force for the empowerment of individuals is certainly in the air. Silicon Valley whiz-bang utopianism is such a successful meme that it has been twice mocked at book length by professional contrarian Evgeny Morozov (2011; 2013). Despite some overstatement by the most ardent proponents of technological liberation, there is truth to the meme. With the Internet, ordinary individuals have gained the ability to reach a global audience, something only available to relatively large and wealthy organizations in the past. Through public disclosure of confidential information, nonprofits such as WikiLeaks and rogue

¹⁴ Kau and Rubin (1981) focus more narrowly on the cost of taxation, but they largely agree with Cowen. They find empirically that tax revenue is a function of self-employment, economies of scale, home production, and urbanization.

individuals such as Edward Snowden (together with his journalist collaborators) have embarrassed and chastened a global superpower.

Moreover, some of the outlandish predictions of the “cyberpunks,” early computing enthusiasts who believed in the power of encryption and the Internet to revolutionize society, have either come to pass or now seem plausible. May’s (1988) “Crypto Anarchist Manifesto” proclaims:

Computer technology is on the verge of providing the ability for individuals and groups to communicate and interact with each other in a totally anonymous manner...Interactions over networks will be untraceable, via extensive re-routing of encrypted packets...The methods are based upon public-key encryption, zero-knowledge interactive proof systems, and various software protocols for interaction, authentication, and verification...But only recently have computer networks and personal computers attained sufficient speed to make the ideas practically realizable. And the next ten years will bring enough additional speed to make the ideas economically feasible and essentially unstoppable...crypto anarchy will allow national secrets to be trade [sic] freely and will allow illicit and stolen materials to be traded...Just as the technology of printing altered and reduced the power of medieval guilds and the social power structure, so too will cryptologic methods fundamentally alter the nature of corporations and of government interference in economic transactions.

It took longer than the decade May predicted, but the release of Bitcoin in 2009 and the backlash against NSA spying revealed by Snowden in 2013 kicked off a crypto-software renaissance. May’s claims now sound prescient. Although “total” anonymity remains elusive due to the difficulty of maintaining operational security, the computing world has moved markedly in the direction of May’s prediction.

More generally, the power of the powerful is declining. Naím (2013) writes of the “End of Power.”

For most of the 20th century, then, the march of technology tended to centralize power, but in recent decades, the trend has reversed. What accounts for this change? This essay develops the distinction between “technologies of control” and “technologies of resistance” and explores the dynamics between technology and power. I first create a model of the size and power of government that is sensitive to parameters representing the technology of expropriation and of sheltering resources. Next, I discuss several specific mechanisms by which new technologies have affected or might affect these parameters. Then I examine the causality in the other direction: the tendency of the exercise of centralized power to elicit investment in technologies of resistance. After that, I apply the model more narrowly to the evolution of services on the Internet as a form of external validation. Finally, I discuss the implications of the theory: How do technologies of control and resistance affect international politics and macroeconomics? What are the implications for public policy? Most generally, I argue that political and institutional economists can no longer ignore technology as a fundamental determinant of social equilibria.

Modeling Governments with Technological Limitations on Expropriation

Throughout this chapter, I focus on the ability of governments or large groups to expropriate resources from individuals or small groups, and argue that this ability varies with the dispensation of technology. I focus on *gross* expropriation—the ability of governments to acquire individuals’ resources regardless of constraints on their use. In

the preceding chapter, I show that governments may be constrained to spend expropriated resources on services the public values—that *net* expropriation may be constrained through low metapolitical transaction costs. That effect is independent of governments' ability to acquire resources in the first place. A government may be able to seize vast amounts of resources and yet be constrained to spend them in the public interest. Or it may have limited ability to acquire resources and complete flexibility to put the revenue directly into favored parties' pockets.

Limits on gross expropriation are consistent with a wide variety of models of government. Government expropriation generates public resistance, it has an opportunity cost, and it can be avoided through changes in activity, resulting in the deadweight loss of taxation. If there were no technological limits on gross expropriation, there would also be no deadweight loss of taxation because governments would have the technology to compel non-avoidance of the tax. Even a model as simple as the Laffer curve implies some technological limits on expropriation.

In order to give the argument structure, I adopt a model of political order similar but not identical to the one in Boix (2015). Boix defines a return to productive activity, r , which is a function of productive technology, $A > 0$, and capital, $k > 0$. Assume two types of agent, i and j , such that $r_i = A_i k_i$ for agent i and likewise for j .

In addition to producing, agents can loot. Boix defines $0 \leq \lambda \leq 1$ as the fraction of time spent looting, $\theta > 0$ as i 's technology of looting (with j 's = $1/\theta$), and $0 < \omega < 1$ as the portion of produced output that is sheltered from looting. The return from looting

for agent i is a function of the order θ , $\lambda_i^\theta(1 - \omega)$ times the amount that j produces.

Similarly, j 's return from looting is $\lambda_j^{1/\theta}(1 - \omega)$ times the amount that i produces.

When both agents produce and devote zero time to looting, they receive $A_i k_i$ and $A_j k_j$ respectively. We can write both agents' more general consumption function as follows:

$$C_i = (1 - \lambda_i)A_i k_i - \lambda_j^{1/\theta}(1 - \omega)(1 - \lambda_i)A_i k_i + \lambda_i^\theta(1 - \omega)(1 - \lambda_j)A_j k_j$$

$$C_j = (1 - \lambda_j)A_j k_j - \lambda_i^\theta(1 - \omega)(1 - \lambda_j)A_j k_j + \lambda_j^{1/\theta}(1 - \omega)(1 - \lambda_i)A_i k_i$$

These consumption functions are composed of three terms. The first term is the amount each agent produces. The second term subtracts the amount of their output that is looted away from them. The third term adds the amount of the other agent's output that is gained through looting.

Each agent can choose his own allocation of time to looting, λ . The first and second derivatives of the consumption with respect to λ are written below.

$$\frac{\partial C_i}{\partial \lambda_i} = -A_i k_i + \lambda_j^{1/\theta}(1 - \omega)A_i k_i + \theta \lambda_i^{\theta-1}(1 - \omega)(1 - \lambda_j)A_j k_j$$

$$\frac{\partial^2 C_i}{\partial \lambda_i^2} = (\theta - 1)\theta \lambda_i^{\theta-2}(1 - \omega)(1 - \lambda_j)A_j k_j$$

$$\frac{\partial C_j}{\partial \lambda_j} = -A_j k_j + \lambda_i^\theta(1 - \omega)A_j k_j + \frac{1}{\theta} \lambda_j^{1/\theta-1}(1 - \omega)(1 - \lambda_i)A_i k_i$$

$$\frac{\partial^2 C_j}{\partial \lambda_j^2} = \left(\frac{1}{\theta} - 1\right) \frac{1}{\theta} \lambda_j^{1/\theta-2}(1 - \omega)(1 - \lambda_i)A_i k_i$$

A few facts about these derivatives stand out. First, we can sign the second derivatives on the basis of θ . When $\theta < 1$, $\frac{\partial^2 C_i}{\partial \lambda_i^2} \leq 0$ and $\frac{\partial^2 C_j}{\partial \lambda_j^2} \geq 0$. When $\theta > 1$, $\frac{\partial^2 C_i}{\partial \lambda_i^2} \geq 0$ and $\frac{\partial^2 C_j}{\partial \lambda_j^2} \leq 0$. When either agent's second derivative is positive, that agent will certainly maximize consumption by selecting a corner solution, choosing λ of either 0 or 1. When $\theta = 1$, both agents have a second derivative equal to zero. Their choice of λ will equal 0 if their first derivative is negative and it will equal 1 if their first derivative is positive.

We can begin to understand the dynamics of the game when we evaluate each of the first derivatives when the other agent chooses a corner solution. When either agent chooses $\lambda = 1$, the other's first derivative is always and everywhere negative. Therefore, if either agent chooses $\lambda = 1$, the other agent always responds with $\lambda = 0$.

From here, it is relatively straightforward to characterize the game separately according to whether $\theta = 1$, $\theta > 1$, or $\theta < 1$.

Solution when $\theta = 1$

When $\theta = 1$, there are linear returns to both production and looting, and therefore the agents will either produce or loot, depending on which leads to higher consumption, but not both. In an exotic case, discussed briefly below, an agent may be indifferent between producing and looting. The derivatives simplify to:

$$\frac{\partial C_i}{\partial \lambda_i} = -A_i k_i + \lambda_j (1 - \omega) A_i k_i + (1 - \omega) (1 - \lambda_j) A_j k_j$$

$$\frac{\partial^2 C_i}{\partial \lambda_i^2} = 0$$

$$\frac{\partial C_j}{\partial \lambda_j} = -A_j k_j + \lambda_i (1 - \omega) A_j k_j + (1 - \omega)(1 - \lambda_i) A_i k_i$$

$$\frac{\partial^2 C_j}{\partial \lambda_j^2} = 0$$

$\frac{\partial c_i}{\partial \lambda_i} > 0$ (and therefore i loots) if:

$$\frac{A_i k_i}{A_j k_j} < \frac{(1 - \omega)(1 - \lambda_j)}{1 - \lambda_j(1 - \omega)}$$

$\frac{\partial c_j}{\partial \lambda_j} > 0$ (and therefore j loots) if:

$$\frac{A_i k_i}{A_j k_j} > \frac{1 - \lambda_i(1 - \omega)}{(1 - \omega)(1 - \lambda_i)}$$

Temporarily ignoring the exotic case in which one agent is indifferent between looting and consumption, let us examine the possible outcomes.

As we have already shown, when either agent loots fully, the other agent's derivative is strictly negative, and therefore the other agent produces. Both agents looting fully results in a payoff of zero, since nothing is produced, and it is therefore not an equilibrium.

When neither agent loots at all, both agents keep what they produce. We can therefore characterize the possibilities in Table 1 below:

Table 1: The Game when $\theta = 1$

	$\lambda_j = 0$	$\lambda_j = 1$
$\lambda_i = 0$	$C_i = A_i k_i$ $C_j = A_j k_j$ $g = 0$ equilibrium when: $1 - \omega < \frac{A_i k_i}{A_j k_j} < \frac{1}{1 - \omega}$	$C_i = \omega A_i k_i$ $C_j = (1 - \omega) A_i k_i$ $g = (1 - \omega) A_i k_i$ equilibrium when: $\frac{A_i k_i}{A_j k_j} > \frac{1}{1 - \omega}$
$\lambda_i = 1$	$C_i = (1 - \omega) A_j k_j$ $C_j = \omega A_j k_j$ $g = (1 - \omega) A_j k_j$ equilibrium when: $\frac{A_i k_i}{A_j k_j} < 1 - \omega$	$C_i = 0$ $C_j = 0$ $g = 0$ (not a possible equilibrium)

We have enough information to solve the game for the special case when $\theta = 1$.

The players will select $\lambda_{i,j} = 0$ (there will be no looting) when:

$$1 - \omega < \frac{A_i k_i}{A_j k_j} < \frac{1}{1 - \omega}$$

On the contrary, they will play $\lambda_{i,j} = (1, 0)$ when:

$$\frac{A_i k_i}{A_j k_j} < 1 - \omega$$

And they will play $\lambda_{i,j} = (0, 1)$ when:

$$\frac{A_i k_i}{A_j k_j} > \frac{1}{1 - \omega}$$

The value g listed in Table 1 is the total amount of looting that occurs under either scenario. In scenarios in which there is looting, the amount of looting is decreasing in ω . In addition, the likelihood of there being a looting scenario is decreasing in ω . When ω approaches 1, no looting is possible and neither agent wants to loot.

The wealth of the agents affects the equilibrium. When $A_i k_i = A_j k_j$, neither agent will choose to loot. Finally, because $1 - \omega$ is less than 1, we can infer that the wealthier agent will never be the one that loots.

In an exotic case, when $\frac{A_i k_i}{A_j k_j} = 1 - \omega$, j produces and i is indifferent between producing and looting. Likewise, when $\frac{A_i k_i}{A_j k_j} = \frac{1}{1 - \omega}$, i produces and j is indifferent between producing and looting. While this is a valid result for the one-shot game, it is worth noting that the weakest possible reciprocity norm developed in a repeated game would nudge the indifferent party to prefer to produce. I discuss some consequences of repeated versions of the game below.

Solution when $\theta < 1$

When $\theta < 1$, j 's second derivative is positive, and he will choose λ_j of either 0 or 1. As before, when j chooses $\lambda_j = 1$, i 's best response is $\lambda_i = 0$ because $\frac{\partial C_i}{\partial \lambda_i}$ becomes strictly negative. When j chooses $\lambda_j = 0$, i 's best response is potentially a fraction of 1. Simplifying i 's first derivative:

$$\frac{\partial C_i}{\partial \lambda_i} = -A_i k_i + \theta \lambda_i^{\theta-1} (1 - \omega) A_j k_j$$

C_i is maximized where $-A_i k_i + \theta \lambda_i^{\theta-1} (1 - \omega) A_j k_j = 0$ for $0 \leq \lambda_i \leq 1$. Solving for λ_i ,

$$\lambda_i^* = \left[\frac{A_i k_i}{A_j k_j} \frac{1}{\theta(1 - \omega)} \right]^{\frac{1}{\theta-1}}$$

We can show that $\lambda_i = 0$ will never be a response to $\lambda_j = 0$ because

$$\lim_{\lambda_i \rightarrow 0^+} \frac{\partial C_i}{\partial \lambda_i} = \infty,$$

implying that some marginal amount of looting will always be worthwhile for i .

λ_i^* will fall into the appropriate range of less than 1 when:

$$\frac{A_i k_i}{A_j k_j} > \theta(1 - \omega).$$

Because $\frac{\partial^2 C_i}{\partial \lambda_i^2}$ is always negative when $\theta < 1$, any local maximum in C_i is a global maximum and C_i is monotonically increasing in λ_i before the maximum and monotonically decreasing after the local maximum. Therefore, when that inequality does not hold (i.e., there exists a local maximum in C_i with $\lambda_i^* > 1$), i will select $\lambda_i = 1$. In addition, the right side of the inequality is always less than 1, directly implying that i will never fully loot if he is wealthier than j .

Table 2: The Game when $\theta < 1$

	$\lambda_j = 0$	$\lambda_j = 1$
$\lambda_i = 0$	$C_i = A_i k_i$ $C_j = A_j k_j$ $g = 0$ <p>(not a possible equilibrium)</p>	$C_i = \omega A_i k_i$ $C_j = (1 - \omega) A_i k_i$ $g = (1 - \omega) A_i k_i$ <p>possible equilibrium</p>
$\lambda_i^* = \left[\frac{A_i k_i}{A_j k_j} \frac{1}{\theta(1 - \omega)} \right]^{\frac{1}{\theta - 1}}$	$C_i = (1 - \lambda_i^*) A_i k_i + \lambda_i^{*\theta} (1 - \omega) A_j k_j$ $C_j = A_j k_j [1 - \lambda_i^{*\theta} (1 - \omega)]$ $g = \lambda_i^{*\theta} (1 - \omega) A_j k_j$ <p>possible equilibrium if:</p> $\frac{A_i k_i}{A_j k_j} > \theta(1 - \omega)$ <p>and j cooperates when:</p> $A_j k_j [1 - \lambda_i^{*\theta} (1 - \omega)] > (1 - \omega) A_i k_i$	$C_i = \omega(1 - \lambda_i^*) A_i k_i$ $C_j = (1 - \omega)(1 - \lambda_i^*) A_i k_i$ $g = (1 - \omega)(1 - \lambda_i^*) A_i k_i$ <p>(not a possible equilibrium)</p>
$\lambda_i = 1$	$C_i = (1 - \omega) A_j k_j$ $C_j = \omega A_j k_j$ $g = (1 - \omega) A_j k_j$ <p>possible equilibrium if:</p> $\frac{A_i k_i}{A_j k_j} \leq \theta(1 - \omega)$ <p>and j cooperates when:</p> $\frac{A_i k_i}{A_j k_j} < \frac{\omega}{1 - \omega}$	$C_i = 0$ $C_j = 0$ $g = 0$ <p>(not a possible equilibrium)</p>

The two possible equilibria, therefore, are one in which i loots and j does not, and vice versa. When i loots, he loots fully if $\frac{A_i k_i}{A_j k_j} \leq \theta(1 - \omega)$ and partially if $\frac{A_i k_i}{A_j k_j} > \theta(1 - \omega)$. Agent j either loots fully or not at all.

There may be circumstances in which one player prefers it when the other one loots. For example, if j 's income is much larger than i 's and ω is close to 1, j will prefer to be fully or partially looted by i than to forgo production. Specifically, j always keeps at least ω of his production when looted, so j will certainly prefer to be looted when:

$$\frac{A_i k_i}{A_j k_j} < \frac{\omega}{1 - \omega}.$$

Likewise, when i is much richer than j , i prefers to be looted.

As with the previous case where $\theta = 1$, the quantity of looting, g , is decreasing in ω . As ω approaches 1, the equilibrium becomes one in which j produces and i loots less and less (although never arriving at zero looting). Furthermore, as ω increases, the inequality threshold for the richer agent to simply cooperate with looting decreases; it is more likely that a cooperative equilibrium will be reached.

Solution when $\theta > 1$

Finally, there is the possibility that $\theta > 1$. In this case, $\frac{\partial^2 C_i}{\partial \lambda_i^2} \geq 0$, and i will choose λ_i of either 0 or 1. As before, when i chooses $\lambda_i = 1$, j 's best response is $\lambda_j = 0$ because $\frac{\partial C_j}{\partial \lambda_j}$ becomes strictly negative. When i produces instead of loots, j will choose $0 < \lambda_j \leq 1$.

Simplifying $\frac{\partial C_j}{\partial \lambda_j}$ for the case when $\lambda_i = 0$ yields:

$$\frac{\partial C_j}{\partial \lambda_j} = -A_j k_j + \frac{1}{\theta} \lambda_j^{\frac{1}{\theta}-1} (1 - \omega) A_i k_i$$

$\frac{\partial C_j}{\partial \lambda_j}$ equals zero where:

$$\lambda_j^* = \left[\frac{A_i k_i (1 - \omega)}{A_j k_j \theta} \right]^{\theta}$$

λ_j^* cannot be zero or negative, although it may be greater than 1, in which case j chooses $\lambda_j = 1$ because $\frac{\partial^2 C_j}{\partial \lambda_j^2} < 0$ and therefore C_j monotonically increases left of the maximum.

λ_j^* is less than 1 when:

$$\frac{A_i k_i}{A_j k_j} < \frac{\theta}{1 - \omega}$$

and otherwise $\lambda_j^* = 1$. The right side of the inequality is greater than 1, which implies that j will never choose $\lambda_j = 1$ when he is wealthier than i .

As with the preceding case where $\theta < 1$, the quantity of looting is decreasing in ω . As ω approaches 1, the equilibrium becomes one in which i produces and j loots less and less (although never arriving at zero looting). Again, as ω increases, the inequality threshold for the richer agent to simply cooperate with looting decreases; it is more likely that a cooperative equilibrium will be reached.

Table 3: The Game when $\theta > 1$

	$\lambda_j = 0$	$\lambda_j^* = \left[\frac{A_i k_i (1 - \omega)}{A_j k_j \theta} \right]^{\frac{\theta}{\theta - 1}}$	$\lambda_j = 1$
$\lambda_i = 0$	$C_i = A_i k_i$ $C_j = A_j k_j$ $g = 0$ <p>(not a possible equilibrium)</p>	$C_i = [1 - \lambda_j^{*\frac{1}{\theta}} (1 - \omega)] A_i k_i$ $C_j = (1 - \lambda_j) A_j k_j + \lambda_j^{*\frac{1}{\theta}} (1 - \omega) A_i k_i$ $g = \lambda_j^{*\frac{1}{\theta}} (1 - \omega) A_i k_i$ <p>possible equilibrium if:</p> $\frac{A_i k_i}{A_j k_j} < \frac{\theta}{1 - \omega}$ <p>and i cooperates when:</p> $[1 - \lambda_j^{*\frac{1}{\theta}} (1 - \omega)] A_i k_i > (1 - \omega) A_j k_j$	$C_i = \omega A_i k_i$ $C_j = (1 - \omega) A_i k_i$ $g = (1 - \omega) A_i k_i$ <p>possible equilibrium if:</p> $\frac{A_i k_i}{A_j k_j} \geq \frac{\theta}{1 - \omega}$ <p>and i cooperates when:</p> $\frac{A_i k_i}{A_j k_j} > \frac{1 - \omega}{\omega}$
$\lambda_i = 1$	$C_i = (1 - \omega) A_j k_j$ $C_j = \omega A_j k_j$ $g = (1 - \omega) A_j k_j$ <p>possible equilibrium</p>	$C_i = (1 - \omega)(1 - \lambda_j^*) A_j k_j$ $C_j = \omega(1 - \lambda_j^*) A_j k_j$ $g = (1 - \omega)(1 - \lambda_j^*) A_j k_j$ <p>(not a possible equilibrium)</p>	$C_i = 0$ $C_j = 0$ $g = 0$ <p>(not a possible equilibrium)</p>

Repeated Versions of the Game

In repeated versions of the game, an infinite array of cooperative equilibria can emerge depending on the punishment strategies that the parties adopt. In particular, there are equilibria with less looting than would occur in a one-shot game. Boix (2015) solves his similar model for a repeated version of the game in which the players play a grim trigger strategy. Although this equilibrium is not subgame perfect, the stylized facts he derives are nevertheless applicable to other solutions: iterated cooperation is more likely to emerge when θ approaches 1, when ω increases, when agents do not heavily discount the future, and when the wealth ratio is not extremely unbalanced.

Interpreting the Model

If we view looting activity (or defense against looting activity) as likely to be institutionalized in a formal government, then the size and power of government would track g . This implies that there are several parameters that affect the size of government. In general, the size of government will decrease as ω , the means of shielding resources from appropriation, increases. In the past, geography was one of the means by which resources were hidden. Scott (2009) shows that one response to expropriation in Southeast Asian city-states was to flee to the mountains, which were harder to traverse and more difficult for the state to control. In the modern era, technology is the new geography. Nearly all geographic formations are now accessible to the state, but some technologies could conceivably make it easier or harder for the state to appropriate resources.

In addition, we can view the parameter θ as also representing the technology of looting and defense. This parameter will also vary on the basis of technology. Firearms might equalize looting and defense capabilities between strong and weak, while other technologies would favor the already-strong.

As Boix emphasizes, wealth equality also plays a role in determining political equilibria in his similar model. Skill-biased technological change as well as the accumulation of capital wealth by the already-wealthy affect the size of government in my model as well.

Two Kinds of Technology

I distinguish between technologies on the basis of the shift they produce in relative power between large or coordinated groups (especially states) and individuals. A *technology of control* shifts relative power away from individuals and toward large or coordinated groups. A *technology of resistance* shifts relative power toward individuals and away from large or coordinated groups. It is also possible that a *neutral technology* will improve the production possibilities of both individuals and large groups in such a way that the balance of power is maintained.

In terms in the model of government above, technologies of resistance tend to increase ω and to moderate θ so as to enable less expropriation in equilibrium, and more cooperation in the repeated version of the game. Technologies of control do the opposite, leading to more looting, or in the institutionalized variant, larger and more powerful government.

Technologies of control tend to support higher raw output than technologies of resistance. They must; if they did not, there would be no reason to prefer a centralizing method of production versus a decentralizing method. Technologies of resistance can be thought of as versions of technologies of control in which some of the gains in output are sacrificed for the sake of robustness to expropriation.

Both technologies of control and resistance improve welfare directly in virtue of the fact that, like all technologies, they create new possibilities for the use of resources. They can also affect welfare indirectly. Technologies of control can enable the provision of new public goods, raising welfare, or they can subject individuals to totalitarian rule, lowering welfare. Conversely, technologies of resistance can undermine the fiscal basis for some public goods, lowering welfare, or they can undermine inefficient government rule, raising welfare.

Mechanisms of Action

When does a technology support control, and when does it support resistance? There are several dimensions on which technologies vary that potentially support the distinction. Some authors have proposed specific and interrelated mechanisms of action by which new technologies can lead to a rebalancing of power.

Mobility and holdup.

Economists have understood since Ramsey (1927) and certainly since Tiebout (1956) that elasticity has an important effect on the exercise of power by the state. More mobile factors of production, such as financial capital, are quicker to flee high taxes or regulatory burdens than are less mobile ones, such as fixed capital. It stands to reason that

technologies that improve mobility are technologies of resistance. Other things equal, they reduce the maximum tax and regulatory burden that can be imposed at a given enforcement cost, raising ω .

In addition to the standard elasticity arguments, mobility can change political equilibria by reducing the possibility of opportunistic behavior by governments.

Production methods that rely on large, fixed investments in highly customized factories will be vulnerable to seizure and holdup by the state in the event of noncompliance (if, indeed, not at other times). These methods will tend to facilitate centralized control.

Technological changes that reduce efficient scale, limit the need for investment in the customization of fixed capital, and make equipment easy to move between jurisdictions tend to undermine control.

The argument that mobility reduces the power of the state has its limits. Caplan (2001) notes that the excess burden of local government inefficiency is capitalized into property values through the property tax. This capitalization impedes economic competition among local governments in the United States, who raise money through property taxes. Yet in addition to throwing cold water on excess Tiebout enthusiasm, Caplan's argument helps clarify exactly when technologies that improve mobility make a political difference. In order to maximize total mobility, technologies should improve the mobility of or create new mobile substitutes for previously non-substitutable immobile factors of production and consumption (like housing). A technology like seasteading or

space colonization could succeed in constraining taxation where Caplan argues ordinary Tiebout competition failed.¹⁵

Disintermediation.

Unmediated economic activity is more sheltered from seizure than intermediated economic activity. Quite simply, it is more costly to seize resources from every person in the economy individually than it is to seize an equivalent amount of resources that are funneled through a handful of companies that have repeated dealings with the state. The degree to which economic activity is organized on an unmediated basis is a function of the available technology as well as of choices to deploy that technology. An economy in which technology for disintermediation is widely deployed is best modeled as having a high ω , and consequently a small equilibrium g .

The contemporary economy is highly intermediated. An astonishing amount of law is enforced not directly by governments but by regulated commercial intermediaries. For example, anti-money laundering laws are an essential component of the government's enforcement strategy against organized crime, drug use, online gambling, and tax evasion. The government uses this strategy because it is easier to regulate US banks and credit card companies than it is to monitor the behavior of 300 million Americans directly. Technologies that disintermediate finance—that make it possible for

¹⁵ The US home ownership rate is about 65 percent, which presumably means that 35 percent of the population is able to vote with their feet at relatively low cost. It would be an interesting test of Caplan's theory to use variation in the home ownership rate to predict local governance quality.

people to transact without an intermediary—therefore threaten the capacity of governments to enforce many of the rules they currently are able to enforce.

Non-financial intermediaries also play a role in government enforcement. The idiom “off the grid,” referring to the electricity grid, has a strong connotation of existing beyond the reach of the state. In many cases that is not literally true, but as Scott (1998) argues, states proceed by relying on a legible field of vision. The act of registering with the municipal electricity and sewage companies imposes a kind of legibility by tying a name to an address. Technologies that disintermediate utilities, such as solar power, might also reduce legibility and therefore state control.

Communication can also be mediated or unmediated. Three broadcast TV networks, or even a few hundred print newspapers, can be easily censored. Webpages, blogs, and online videos are more difficult to control. Similarly, a few dozen major Internet service providers can be forced to comply with surveillance requests, but more decentralized market structures for Internet access and services (such as mesh networking) might make surveillance costlier or less complete.

Decentralized platforms for commerce may also reduce the power of the state. For example, OpenBazaar is an open source software project that aims to enable peer-to-peer commerce. Without an intermediary to punish, governments may have a difficult time enforcing prohibitions on commercial goods on an ex ante basis.

Demonopolization.

When used strategically, monopolies provide political leverage and move θ away from 1, thereby increasing the size of government in equilibria in which the stronger

party governs. Governments that strategically wield monopoly power simply have more coercive tools than identical governments that have no monopoly to lever. As a result, their total coercive ability is necessarily higher.

Governments in fact often use monopolies strategically. A clear contemporary example is Russia's effective natural gas monopoly in parts of Europe. Russian president Vladimir Putin has used his country's market position as a political instrument, for example by cutting off gas to Ukraine in 2006 and 2009. In the past, governments have monopolized the water supply, controlling both irrigation and transportation. Wittfogel (1957) calls this a "hydraulic empire." For example, the Pharaohs of ancient Egypt were able to leverage control of the Nile to effect far more control over society than contemporaneous governments without a monopolizable resource.

Technologies that reduce market power of a politically levered monopoly can therefore support resistance. More and better solar, wind, nuclear, or coal plants would reduce Europe's reliance on Russia's gas exports and therefore Russia's ability to influence European politics. More energy-efficient machines, light bulbs, and insulation, as well as cheaper batteries, would also reduce base-load energy requirements and therefore weaken Moscow's influence. Similarly, desalination or water reclamation technology could reduce water monopolization, and alternative forms of transportation reduce the gains to controlling a river such as the Nile.

In addition, monopolization of domestic resources for sale on the foreign market can result in a resource curse. Rentier states (Mahdavy, 1970) are often indifferent or hostile to the demands of the population because they do not rely on them for tax

revenue. If anything, they view the public as a political threat that could unseat them. The rent from the monopolized resource enables the state to finance political repression. Technologies that remove the rent (for the case of fossil fuels, alternative energy technologies again), therefore, have the potential to empower the general public against the ruling elite in resource-rich countries.

Information and coordination.

Governments must engage in internal coordination if they are to govern to any significant degree. They must be able to communicate outside the view of their enemies as well as without interception from domestic opposition. To some degree, individuals resisting centralized control or engaging in illegal enterprises must also communicate and coordinate. The ability to communicate securely is therefore fundamental to political equilibria, affecting both ω (a well-coordinated government can more thoroughly extract resources from a given population) and θ (technologies that lead to transparency may equalize relative power).

Assange (2006) explicitly models authoritarian regimes as necessarily conspiratorial; their actions would induce opposition and overthrow if they were publicly known. The need to act in secrecy and avoid exposure to leakers places a limit on the size of conspiracies, or at least imposes additional costs. New technologies that make conspiracies more susceptible to discovery or public exposure therefore reduce the size of conspiracies and of the state. This theory was supported after the Snowden leaks, when the NSA adopted a “two-person rule” for accessing sensitive data, often referred to as the

“buddy system” (Greenberg, 2013). The system by definition reduces the productivity of NSA employees.

An important improvement to Assange’s theory might be to apply more symmetry as well as marginal analysis to the argument. Technologies that enable secure communication and coordination will, at the margin, lead to more effective conspiracies for both governments and resistance groups. Technologies that undermine secure communication will lead to less effective conspiracies for both groups, again at the margin.

The net effect of a technological change on the relative marginal power of states and resisting groups will depend on the starting position. A state that is able to coordinate somewhat openly on the basis of superior strength and the threat of force (for example, having a secure military facility all entrants into which are screened) will have some initial conspiratorial power. A technological change improving the security of communication will add to the conspiratorial ability of both states and resisting groups. Since states are presumed to have some initial conspiratorial power, an equal marginal improvement in both parties’ ability to coordinate will tend to equalize the ratio of conspiratorial power between states and resisters.¹⁶

¹⁶ In addition, the fact that governments have at times been quite opposed to public use of strong encryption is additional evidence that encryption undermines their control. Until the 1990s, in the United States encryption was classified as a munition and subject to export controls. In the mid-1990s, the NSA lobbied for a “key escrow” system in which it would retain access to a backdoor for domestic consumer encryption applications. The plan was dropped, but in the mid-2010s, similar goals have been voiced by law enforcement agencies that fear “going dark” in face of whole-disk encryption on Apple and Google devices. A number of so-called “cypherpunks” have argued that widespread

Technologies may have differential marginal effects on conspiratorial power depending on the size of the conspiracy, as well as on the degree to which the conspiracy relies on non-technological strategies for securing communication. Technologies might also be more susceptible to copying than other strategic advantages, and therefore it may be that the more that strategies for secure communication come to rely on technology, the more that conspiratorial power tends to become equalized.

Misinformation and trust.

Misinformation is a substitute for censorship. As the Internet has reduced governments' ability to control the flow of information, some governments have compensated through the increased use of propaganda. In Russia, the policy has been explicitly stated by Vladimir Putin: "In the modern world you cannot limit anything, you must simply work more effectively in this area" (Gutterman, 2011). The Russian government employs an elaborate Internet "trolling" apparatus whose purpose it is to make anti-Kremlin information appear less reliable (Chen, 2015; Aro, 2016). Assuming that only the government is able to engage in a concerted disinformation campaign,¹⁷ this strategy moves θ in a direction favorable to the government by making it difficult for dissident groups to know how to act.

availability of strong encryption will lead to the diminution (if not abolition) of the state (see e.g., May, 1988).

¹⁷ What would a disinformation campaign by the general public look like? Could such a campaign function at scale without confusing its own members? If disinformation campaigns require a closed conspiracy, as seems likely, could a large number of small, closed disinformation campaigns exist without serious side effects for the economy? As these are difficult questions, it seems safe to provisionally assume that disinformation campaigns are possible tools of governments and not subjects.

Sock puppetry can change readers' estimates about the most dominant social beliefs, which businesses have the best customer service, which candidates have the most support, and whether revolutions are likely to succeed. As a result, technologies that ascribe an accurate reputational score to purported information are valuable to those who lack the resources or coordination to engage in sock puppetry, at the expense of those who are engaging in it. As an example of a technological solution to sockpuppetry, blockchains may be used in the future to create secure pseudonymous identities with persistent reputations, which could be used to authenticate comments on online media.¹⁸

Another way of countering misinformation is through public prediction markets. Hanson (2013) discusses this point relative to his proposal for using prediction markets as a governance mechanism: "With decision markets, the public will have a new powerful way to avoid lies: ignore the talk and just look at market prices" (p. 167). Prediction markets are heavily regulated in the United States¹⁹ and centralized markets could conceivably be censored or falsified by governments in general. Consequently, technology that enables decentralized prediction markets may be necessary if the markets

¹⁸ There have been several independent proposals to design blockchain-based identification systems. A common move is to make identities scarce by using verifiable bonding. Users create an identity in the system and then give away a non-trivial amount of cryptocurrency to a random miner. In so doing, they create an identity that is secure, decentralized, and initially pseudonymous, but not costlessly disposable. Such an identity can be used, for example, to authenticate comments on blogs, so that trolls can be banned and trustworthy individuals could build a good reputation. These decentralized reputation mechanisms could limit the ability of powerful groups to deceive the disorganized masses.

¹⁹ For an overview of the regulatory environment surrounding prediction markets, see Ozimek (2014).

are to support subversive correction of state-sponsored misinformation. Again, one possible solution would be to use blockchains.²⁰

In addition to bets on simple propositions, combinatorial prediction markets support conditional bets; that is, bets contingent on some given condition occurring (Hanson 2003). Such bets would publicly reveal information that could counter the official government narrative. For example, consider a market estimating future congressional budget deficits contingent on particular legislation passing. Such a market may reveal an estimate that differs significantly from government budgetary scoring of legislation. As a result, the public would be empowered versus a baseline in which only the government knows the true estimate of the fiscal effect of legislation.

Organizational factors.

Organizational modes can also affect the ability of the state to extract resources. It is easier for the state to enforce laws against enterprises that produce financial profit than against organizations that instead produce widely distributed nonfinancial benefits. Replacing a single firm that engages in innovation for profit with a loose network of volunteers means that the benefits of the innovation are not concentrated in one entity and do not exist in a form that can be seized. Nonfinancial, nonprofit organizational modes therefore raise ω , the fraction of resources that are shielded from expropriation.

Organizational innovations that enable projects to be pursued on these models, therefore, should be counted as technologies of resistance. An example is the idea of open

²⁰ One promising project to build decentralized prediction markets is known as Augur. It uses the Ethereum blockchain.

source software projects, which have frequently been used when there is a need to skirt the edge of legality.²¹

In addition to the organizational model itself, the coordination tools that enable the model to exist also deserve mention. The Internet was responsible for an increase in the use of the open source model, because it enabled cheaper and better coordination with other participants in projects. Likewise, software that facilitates cooperation within open source projects, such as git or MediaWiki, also enables resistance on some margins.

A distinction can also be drawn between centralized online services and decentralized online protocols. Internet messaging can be supplied to the market as a centralized service (as with Facebook messages) or as a decentralized protocol (as with email). Governments are more likely to succeed at regulating centralized services rather than decentralized protocols, both out of the sheer increase in the number of parties to regulate and because of the fact that the consumer surplus afforded from a decentralized model cannot be seized *ex post*.

There are other reasons besides evading government control to use the open source model; it is not used exclusively for legally controversial software products. In many cases it simply is the organizational form that minimizes transaction costs as in Coase (1937). But its dominance in projects that are legally controversial suggests it is at least sometimes used as a method of avoiding government control.

²¹ Open source projects have been used to produce encryption software when the United States had strong export controls on encryption, to decode DVDs without licenses to DVD technology, and to produce file-sharing software. OpenBazaar, mentioned above, is an open source project. Cryptocurrencies such as Bitcoin are almost universally open source.

Demand for collective action.

Some problems require collective action—until new technologies solve them. One example may be climate change. Carbon emissions reduction is a hard global political problem, requiring international accountability that has to date been elusive. The threat posed by climate change creates demand for government regulation and for centralized political mechanisms, possibly even at a global scale, to enforce them.

If new technologies—solar, wind, fusion—were able to produce power more cheaply than carbon-based fuels, then little international coordination would be necessary to address climate change. No global governance mechanisms would need to be created. Technologies that solve complex political problems through market mechanisms therefore reduce the demand for centralized political authority.

Another problem that requires state intervention is Akerlof's (1970) lemons problem: asymmetric information causes the market for goods of variable quality to unravel. Technologies that resolve the information asymmetry can therefore undermine the need and justification for state intervention. Tabarrok and Cowen (2015) and Thierer, Koopman, Hobson, and Kuiper (2015) argue that this is precisely what has happened in recent years.

This section has mostly dealt with supply-side constraints on the state, and therefore this proposed mechanism of action for technologies of resistance is somewhat different than the others. But supply and demand are interrelated; the demand for collective action is an input into supply-side constraints. High demand for centralized political mechanisms creates a stable base from which to exercise power in unrelated

activity such as generalized expropriation. Once created, these mechanisms may be subject to rent seeking and mission creep. The influence of purpose-built political institutions may extend to areas unrelated to that purpose. As a result, demand for centralized political mechanisms increases the relative power of the state, moving θ away from 1. Transforming what have in the past been public goods problems into private goods non-problems will therefore have the effect of decreasing the power of the state, at least in the long run.

Incentives and Technological Change

The previous section argued that the nature of available technology affects political possibilities. A new technology may limit the power of the state; another one may expand it. This section argues the reverse: incentives created by the policy environment have an effect on the composition of new technologies. Extractive policies and political institutions create an incentive to invest in technologies of resistance, while liberal institutions tilt the incentives in favor of technologies of control.

It would be odd if the composition of technology *did not* respond to economic and political incentives. Invention is investment-intensive. People do not make many costly investments out of the goodness of their hearts. Consequently, incentives should affect the composition of innovations that receive research, development, and commercialization investments. Because the economics literature going back to Solow (1956) has tended to think of technology unidimensionally, it is worth supporting the claim that incentives affect the composition, not just the amount, of technological progress, compared to random allocation of new innovations across the two categories.

Evidence from the Industrial Revolution

Steam-powered turbines were invented at latest by the first century, but not used in industry until the 18th century. Hero of Alexandria describes a device known as an aeolipile that uses steam to cause revolution of a ball on a pivot. While there are significant differences between this device and Newcomen's engine, it is noteworthy that it took nearly 1700 years after Hero's discovery for steam power to be used for industrial purposes.

One possible explanation for this delay is that steam-powered factories are typically conspicuous fixed capital that is easily expropriated—in the language of the previous section, they are technologies of control. In relatively illiberal Hellenistic Egypt and indeed in most of the pre-Enlightenment world, property rights would not have been secure enough to support the fixed investment necessary to make effective industrial use of steam technology.

Why the industrial revolution came about only in the 1760s, and why only in England and to some extent Holland, is a question that has created serious identification problems for economic historians. North and Weingast (1989) argue that the transition has its roots in political changes in the Glorious Revolution, which increased the power of Parliament and created the framework of constitutional monarchy. Other economists argue that the onset of the industrial revolution was due to changes in ideas. Mokyr (2005) traces it to the ideas of Francis Bacon, the scientific method, and the broader Enlightenment. McCloskey (2010) emphasizes the importance of sociological factors that raised the status of the bourgeoisie.

Whichever of these explanations (or combinations of them) holds, it seems probable that a relatively liberal institutional context created incentives for the first time for the investment in fixed capital by anything more than a small, powerful elite. Prior to the industrial revolution, Pharaohs and emperors may have at times invested in fixed capital, but they required armies to defend their investments. The fact that the industrial revolution happened relatively soon after a liberal institutional context developed is evidence for my broader claim that the direction and shape of technological development, not just the overall level of technological change, is affected by political incentives.

Evidence from the United States in the 20th Century

Over the course of the 20th century, the United States experienced dramatic economic and technological change. At the beginning of the century, over a third of the population worked in agriculture; few had access to electricity, telephones, radio, or automobiles; there were no airplanes. As late as 1930, federal outlays were only 3.4 percent of GDP (Office of Management and Budget, n.d.). By the end of the century, all of these technologies were commonplace, as was television, computers, and the Internet. Only about 3 percent of Americans worked in agriculture in 2000. Federal outlays reached 18.9 percent of GDP in 1952 and have not fallen below 16 percent since.²² A reasonable approximation is that over the course of the century, there was a 10x reduction in the agricultural workforce and a 10x increase in the size of government.

²² They reached 42.7 percent of GDP during World War II, but were as low as 11.3 percent in 1948.

Yet this economic and technological change was not uniform or neutral. As Cowen (2009) argues, technologies that developed in the first half of the 20th century—in transportation, communication, industrialization, and management science—united to support a large state for the first time. The United States began the century with a relatively economically unobtrusive government, which preceded the invention and adoption of a great number of what I have called technologies of control.

Kau and Rubin (1981) make a similar argument for the growth of government, focusing more specifically on the cost of collecting tax revenue, and using empirical data through 1970. In addition to technological changes leading to economies of scale and urbanization, they place special emphasis on increased female labor force participation, which increased the size of the formal labor sector at the expense of the informal household sector. Estimating a system of simultaneous equations, they are able to explain virtually all of the growth of government between 1929 and 1970 through technological changes.

In the latter part of the 20th century, the story is different. It has been accompanied by much greater interest in what I have called technologies of resistance. Mobility and demonopolization have been significant themes. Technologists (including in the government) began experimenting with packet-switched communications in the 1960s, which would eventually become the Internet and undercut traditional telecommunication and media monopolies. Malcom McLean developed standardized containerization in the 1950s, which supported lower shipping costs, globalization, and therefore (especially labor-related) regulatory arbitrage. Personal computing, an alternative to the centralized

and monopolistic mainframe-computing model, developed in the 1970s and 1980s. In the 1990s, interest in encryption and online commerce waxed bright. Throughout this period, specialized human capital investments have grown—such investments are by definition as mobile as human beings are.

Perhaps not coincidentally, the period since 1973 has been called the Great Stagnation (Cowen, 2011). As I argue above, technologies of resistance are generally associated with lower growth than technologies of control, because they sacrifice some of the gains from growth to provide resilience against expropriation. The slowdown in total factor productivity during this period is therefore consistent with a midcentury shift from technologies of control to technologies of resistance in response to higher levels of taxation and regulation.

Looking into the future, there may be additional evidence for my hypothesis. Cowen notes that “large corporations and large governments have common technological roots” (2009, p. 12). He also observes that in the early 20th Century, firms grew large several decades before governments did. “But this should come as no surprise. We should expect that private firms are more adept at adopting new technologies than are governments” (2009, p. 12).

An intriguing possibility is that private firms would adapt before governments to technologies of resistance as well as technologies of control. Insofar as new technologies reduce the equilibrium size of government, they are likely to also decrease the equilibrium size of firms. Political adjustment might lag economic adjustment. Choi and Spletzer (2012) note that employees per establishment and employees per firm are both

on the decline. Establishment size peaked in 2000 at 17.5 employees and fell to 15.7 in 2011, a decline of more than 10 percent. A similar, but less pronounced, reduction in firm size also occurred over this period. If the pattern is to continue, within a decade or two, the government must shrink in relative size.

Evidence from Simultaneous Invention

For the direction of technological change to respond to political incentives as I have hypothesized, a precondition is that technological change is non-random. Fairly strong evidence for non-random technological change comes from the prevalence of simultaneous invention. If new inventions are sprinkled about randomly, then simultaneous invention of the same advance should be somewhat rare. But if instead technological change is a multidimensional process with a path that can be influenced through incentives, we should expect those incentives to generate simultaneous invention fairly often.

Kelly (2010) argues that simultaneous technical invention and scientific discovery is the norm, not the exception. Charles Darwin and Alfred Russel Wallace independently came up with the theory of evolution at almost the same time. Alexander Bell and Elisha Gray both applied to patent the telephone on February 14, 1876.

Sunspots were first discovered not by two but by four separate observers, including Galileo, in the same year, 1611. We know of six different inventors of the thermometer, and three of the hypodermic needle. Edward Jenner was preceded by four other scientists who all independently discovered the efficacy of vaccinations. Adrenaline was “first” isolated four times. Three different geniuses discovered (or invented) decimal fractions. The electric telegraph was reinvented by Joseph Henry, Samuel Morse, William Cooke, Charles Wheatstone, and Karl

Steinheil. The Frenchman Louis Daguerre is famous for inventing photography, but three others (Nicephore Niepce, Hercules Florence, and William Henry Fox Talbot) also independently came upon the same process. The invention of logarithms is usually credited to two mathematicians, John Napier and Henry Briggs, but actually a third one, Joost Burgi, invented them three years earlier. Several inventors in both England and America simultaneously came up with the typewriter. The existence of the eighth planet, Neptune, was independently predicted by two scientists in the same year, 1846. The liquefaction of oxygen, the electrolysis of aluminum, and the stereochemistry of carbon, for just three examples in chemistry, were each independently discovered by more than one person, and in each case the simultaneous discoveries occurred within a month or so. (Kelly, 2010, Kindle Locations 2051-2062)

Lemley and Chien (2003) find that “a large number of [patent] priority disputes involve near-simultaneous invention” (p. 1300). Lemley (2007) argues that an independent invention defense would eliminate the “patent troll” problem that has proliferated in recent years.

Insofar as some inventions are thought to be singletons, simultaneous invention may be underreported, or identical lines of research may become abandoned when news arrives that another group was successful. The evidence we observe necessarily understates the true degree of simultaneity. Overall, it seems clear that the direction of technological innovation is non-random.

The Internet Epicycle

What about the Internet? In many respects, the Internet has advanced human liberty. A number of journalistic and scholarly accounts have suggested that it played a

crucial role in the Arab Spring.²³ Consequently, it seems natural to classify the Internet as a technology of resistance. Yet empirically, so far the effect of the Internet on the size (if not the power) of the state has been muted.

Time series data on global government revenues and expenses from the World Bank suggest little change in central government finances over the period that produced adoption of the Internet. Figure 1 shows revenues and expenditures from 1990 to 2013 as a fraction of global GDP. Over this period, government revenues grow from 22.3 percent of GDP to 25.3 percent, and expenditures grow from 25.0 to 28.7 percent. If the Internet is playing a role in shrinking the size of the state, then some other countervailing force is simultaneously increasing it. While government finances are not the only or even the best measure of government power, evidence at the macro level does not support the notion that as of 2013 the Internet has shrunk the state.

²³ Farrell (2012) reviews some of the mixed evidence for this claim.

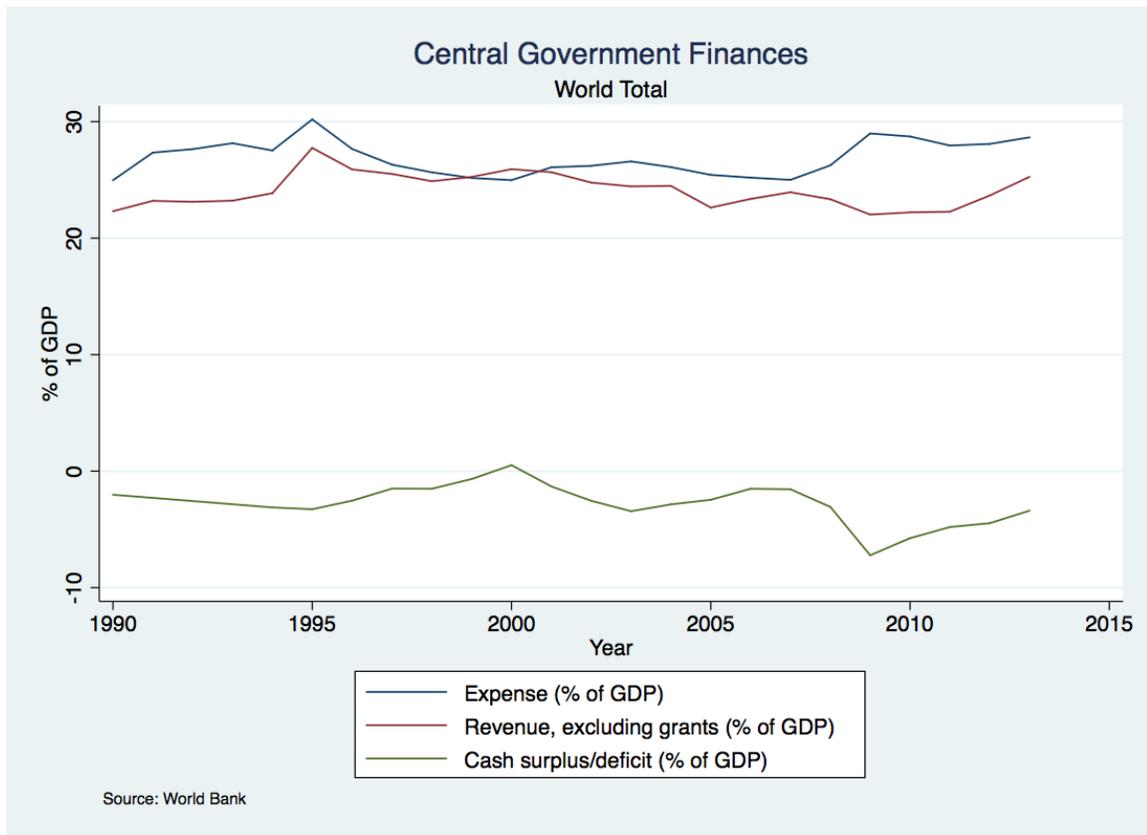


Figure 1: Central Government Finances

Disaggregated cross-country panel data provides a more granular perspective on the same question. I run four two-way fixed-effects regression of various measures of state power on Internet penetration. The dependent variables are the Fraser Index of Economic Freedom, central government tax revenues, central government total revenues excluding grants, and central government surplus or deficit. To control for wealth effects, I include per capita GDP adjusted for purchasing power parity.

In all four regressions, Internet penetration has the predicted sign but is statistically insignificant. Taking the point estimates at face value, going from zero

percent Internet penetration to 100 percent penetration holding wealth, country, and year constant results in an additional 0.08 points on Fraser’s index, a 1.1 percentage-points-of-GDP reduction in central government tax revenue, a 1.7 percentage-points reduction in total revenues, and a 1.4 percentage-points increase in the fiscal deficit. The results of the regression are displayed in Table 4.

Table 4: The Effect of Internet Adoption on Size of Government

	(1)	(2)	(3)	(4)
	Fraser Index of Economic Freedom	Central Government Tax Revenues	Central Government Total Revenues excl. Grants	Central Government Surplus or Deficit
GDP per capita, PPP	-3.05e-06* (1.65e-06)	0.000135* (7.77e-05)	0.000154** (7.23e-05)	0.000130 (9.58e-05)
Internet users (per 100 people)	0.000828 (0.000986)	-0.0113 (0.0197)	-0.0176 (0.0280)	-0.0140 (0.0201)
Constant	6.801*** (0.0915)	15.29*** (1.671)	23.89*** (2.081)	-2.660 (2.045)
Observations	2,369	2,468	2,449	2,352
R-squared	0.021	0.035	0.025	0.078
Number of countries	137	166	166	161

Clustered standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The data have some weaknesses. Although some data for these variables are available as far back as 1990 and as recently as 2013, some observations are missing. In addition, in models 2-4, the dependent variable is *central* government tax and total revenue and surplus, not those values from all governmental units. In addition, these

dependent variables may not be the best measures of the ability of governments to project power.

Caveats aside, these regressions show that if the Internet is operating as a technology of resistance, its effect remains significantly muted as of 2013. One reason that this may be the case is that during most of the studied period many of the latest Internet-related technologies of resistance, such as cryptocurrency, did not yet exist. In addition, the Internet may also have some elements that make it a technology of control. As the Edward Snowden leaks demonstrate, governments have leveraged the Internet to create impressive surveillance systems. China has been relatively successful at online censorship, and Russia is a prolific online propagandist. While the Internet is still arguably a win for freedom over tyranny, especially when compared to previous telecommunication systems, recent experiences make clear that it is more of a tradeoff than many had previously recognized.

Furthermore, it may be best to consider the Internet era not as monolithic, but rather as varying over time. Consumer and producer practices on the Internet have evolved more rapidly than in the rest of the economy, and online technology has therefore undergone cycles of control and resistance more quickly than has industrial technology. It is fair to call technological change on the Internet an epicycle of broader trends in technology. The early Internet was protocol-focused and therefore quite decentralized. From the mid-1990s to mid-2000s, Internet firms de-emphasized decentralized protocols in favor of centralized services, and use of centralized private

clouds became more popular. In recent years, there has been growing interest in re-decentralizing the Internet. I now discuss each of these trends in more detail.

Protocols versus Services

The creation of the Internet itself was a backlash against the centralized, hierarchical model of communication that prevailed in telecommunications. One reason that the Pentagon funded early packet-switching research was to provide communications robustness and resilience in the face of the new nuclear threat. As such, the Internet is quite explicitly an instance of technological resistance to threatened control by an external power.

The culture of decentralization was strong in the first several decades of the Internet. The early Internet used mostly decentralized protocols. For example, SMTP, the protocol that relays email, was defined in 1982. HTTP, the protocol that serves web pages, was originally defined in 1991. These protocols enabled decentralization because anybody could set up a compatible mail or web server.

More recently, decentralized protocols have been increasingly displaced by centralized services. For example, Facebook allows for messaging and content publishing on a centralized basis. In order to send a message on Facebook, one must have a Facebook account. There is no possibility of interoperability with Facebook without consent and permission.

On the Internet, therefore, the tension between technologies of control and resistance has manifested over where network effects are situated: at the protocol level or at the service level.

It is possible to see the shift from protocols to services as a result of incentives. The early Internet was organized along the lines of protocols because it was a research project without immediate prospects for monetization. There was, therefore, no incentive to build the centralized team of talented engineers necessary to put forward a single, unified user experience that might maximize consumer value.

As the Internet (and the market for software developers) matured, the gains to centralizing services came to outweigh the costs. Problems with spam originating on decentralized services could be better policed on proprietary messaging platforms. Proprietary and centralized “app stores” are increasingly replacing the open web because there is value in certification that programs meet certain minimum security and quality criteria.

The Move to the Cloud

One aspiration of early Internet pioneers was to make location irrelevant. The Internet was a global, borderless network. All information would be globally accessible as long as one jurisdiction allowed it. Jurisdictional competition would lead to certain countries becoming “data havens,” much as some countries are “tax havens” today.

In fact, it has not worked out this way. Traditional nation-states have been able to regulate Internet companies despite the fact that data freely flows online. For example, in 2000 France was able to enforce its rule against the sale of Nazi paraphernalia against Yahoo! Auctions despite the fact that Yahoo! was an American company. Yahoo! had offices, personnel, and equipment in France, which could be seized if the company did not comply.

More generally, the speed of light plays a barrier in preventing jurisdictional competition. Even without explicit blocking, companies that do not host their content on servers close to their customers will deliver a slower experience than their competitors who do host locally. As a result, the trend has been to disseminate online content through content delivery networks, a collection of servers located around the world that mirror content from an origin server. Operating or contracting with CDNs located in many physical jurisdictions potentially subjects content providers to the control of law.

Cloud service providers are new intermediaries. Although they provide little that could not be decentralized through independent hosting, there are economies of scale in running a data center that make available cost reductions that are inevitably appealing to online companies. As a result, insofar as these companies do not feel overly burdened by the regulation that is foisted upon them via control over the new cloud services intermediaries, it is unsurprising that the technology has evolved in the direction of this new intermediation.

Growing Interest in Technologies of Resistance

The past three to five years have seen a marked revival of interest in the cypherpunk agenda of the 1990s. Bitcoin, an unmediated and therefore censorship-resistant system of online cash, was invented in 2008 (Nakamoto, 2008). The Snowden leaks renewed interest in encryption of communications. The shutdown of online black markets like Silk Road has generated interest in fully decentralized online marketplaces such as OpenBazaar. Ongoing regulatory prohibition of prediction markets has fueled the

search for decentralized alternatives such as Augur. Decentralized social networks have been floated, although none of these has generated significant momentum yet.

Each of these Internet applications raises the cost of centralized government control over human activity. Cryptocurrencies such as Bitcoin not only make it more difficult for governments to enforce laws against the sale of illicit goods, but also make it easier for individuals to shelter wealth from taxation by the state. The ability to evade capital controls or simply to hide wealth reduces the legibility of the financial system to the government. Cryptocurrencies, therefore, not only expand the size of the private sector, they potentially shrink the size of the public sector. Encryption makes it more difficult for governments to detect illegal activity. Decentralized commerce, prediction markets, and social networks take commercial, informational, and social activity out of the realm of what the government can easily control.

At the more fundamental protocol level, innovation may undercut some of the logic of cloud hosting. New protocols are beginning to reduce the number of round trips needed to access data. HTTP/2 implements server push technology to deliver to the client data it is likely to want before it is requested. QUIC operates at an even lower level, establishing a connection with a server with fewer round trips than TCP, which is currently used for web browsing. Because connection speeds are bounded by the speed of light, reducing the number of round trips is critical to improving performance.

The performance improvements embedded in these techniques are more significant at high latencies than low ones. A protocol change that saves one round trip will only save a few milliseconds if the server is located nearby, but it will save more

than 400 milliseconds if the connection is over a geostationary satellite link. Since upgrading to the newer protocols can save several round trips, the switch to them will disproportionately benefit high latency connections. This could reduce reliance on local servers, and increase the feasibility of using a remote data haven. Perhaps relatedly, some startups are now examining the possibility of hosting servers in space.

New protocols enabling content-based addressing also undercut the logic of centralized cloud hosting. Traditionally, the World Wide Web has worked by connecting browsers with particular servers that host the content they wish to access. With content-based addressing, users request a particular piece of content from a peer-to-peer network without any consideration of the identity or location of the server that ultimately fulfills the request. Integrity of the content is enforced through cryptographic hashing. Popular content is automatically replicated as it is routed through the network, keeping latency down. To a considerable if not complete extent, this scheme significantly advances the original dream of the Internet as a deterritorialized space by making the speed of light irrelevant.

If these trends continue, the Internet of the near future may support nearly unfettered commerce and communication. Although governments might always be able to punish prohibited behaviors after the fact, widespread use of encryption and disintermediation will make prior restraint difficult.

Control and Resistance inside the Technological Frontier

So far I have discussed primarily the dynamics between technology and political institutions on the technological frontier. The dynamics operate differently inside the

frontier, where international technology transfers can create unfortunate mismatches in institutions and technology. Analysis of these international effects yields a first set of policy implications.

Consider a world in which the frontier societies have high levels of economic freedom and developing countries are highly authoritarian, and assume that new technologies flow relatively unimpeded across borders. Since most new technologies are developed on the frontier, they will tend toward centralized, growth-oriented technologies. New technologies of control will push the world as a whole—both on and off the technological frontier—in a more illiberal direction.

In the frontier societies, political institutions will become somewhat more extractive until it becomes worthwhile for innovators to tend toward technologies of resistance. That is, there is a mechanism of feedback that keeps frontier societies within some normal range of liberalism and illiberalism. In developing countries, that feedback mechanism is absent. These countries have started out with illiberal institutions, and the new technologies that they import often have the effect of entrenching the extractive state, even as they make non-frontier societies wealthier.²⁴

²⁴ As the regression results displayed in Table 4 show, holding Internet penetration constant, wealthier countries have bigger governments, although the effect is only statistically significant at the commonly used $p < 0.05$ -level in one specification. The technological effect I am positing in this chapter is a countervailing one, but I make no claim that it must dominate the independent effect of higher wealth on the size of government. Within the context of my model, we would expect wealthier societies to have larger governments since subsistence-level income is to a considerable extent sheltered from taxation through immediate consumption. Other things equal, that is, poorer societies have a higher ω . But even if higher wealth leads to bigger government

In the GDP statistics, these poorer countries will continue to grow. As Rodrik (2014, p. 8) says, “Growth miracles are enabled by the fact that industrialization can take place in the presence of a low level of fundamental capabilities: poor economies can experience structural transformation even when skills are low and institutions weak.” Technologies of control, I have argued, are associated with higher economic growth than technologies of resistance. But in the long run, this growth may underwhelm, as political institutions stagnate or deteriorate. They certainly will not be in a position to contribute to the world’s stock of technological innovation. This dynamic may be yet another reason why catch-up growth is easier than growth on the technological frontier.

This effect can perhaps explain why the 20th century was such a bloody one. Rummel (1994; 2005) estimates that governments killed 260 million noncombatants between 1900 and 1987, many more than in any previous century. As technologies of control developed in liberal, frontier economies diffused to the rest of the world, high levels of social control combined with extractive institutions to lead to killing on an industrial scale. Rummel estimates that the Soviet Union and Communist China are each responsible for more than 60 million murders. It is hard to imagine that murder on this scale would be possible would have been possible without technologies developed in more liberal contexts.

through other channels, that does not significantly undermine my model as long as technology has an independent effect.

Policy Implications

Because of the impact of technologies of control on societies inside the technological frontier, technologies of resistance are global public goods. People living under authoritarian regimes are largely unable to shape the direction that technological progress takes in frontier societies. As a result, technologies of resistance are underprovided from a global perspective.

Yet not only is the composition of technology not considered in international aid contexts, if anything there is a premium placed on raw growth. This biases humanitarian foreign investment and aid toward projects that will tend to transfer technologies of control, which are usually associated with higher growth. Developing countries will be helped to industrialize even as they lack the social and political institutions that drove industrialization in rich countries. An autocratic government with control over an industrial infrastructure will be quite powerful relative to what it could produce without external influence.

Wealth matters along with freedom, and therefore it is not satisfactory to suggest that rich countries should cease to supply aid geared toward building wealth in poor countries. But alongside such aid, some thought should be given to the composition of technology that is being transferred and subsidized in the developing country. Government agencies involved in international aid should make an effort to supplement existing efforts with transfers of know-how relating to open source software, cryptocurrencies, mesh networks, solar power, and encryption. More research could be geared toward open protocols and mesh networks that can replace centralized services in

rich and poor countries alike. Interestingly, the State Department has already given grants to support the production of subversive communications equipment, such as “the Internet in a suitcase.”

With more access to technologies of resistance, developing countries might organically develop more robust institutions that are better able to support long-run growth. As a result, it seems advisable for countries at the technological frontier to subsidize such globally beneficial technologies. These subsidies can benefit the world by exporting non-extractive political equilibria. If the frontier economies export more technologies of resistance than technologies of control, the capacity of political institutions around the world to support extractive policies will decline.

Smoothing the Domestic Technology Cycle

If technology and politics co-evolve in long cycles of control and resistance as I have proposed, then it may be desirable to diminish the amplitude of these cycles for purely domestic reasons. Such dampening may result in less social and economic disruption associated with these large social changes. The issue of dampening can be approached either from a perspective of achieving a steady state or from that of adjustments from the point at which the economy is highly control-oriented and there is strong interest in technologies of resistance. I discuss both of these in turn.

Targeting a Steady State

The theory in this chapter predicts that the benefits of investing in technologies of resistance are partially, if not fully, capturable when institutions are extractive. They may

not be capturable at all when institutions are non-extractive. Technologies of resistance, therefore, will be underprovided, especially at times when institutions are non-extractive.

This underprovision during the non-extractive era is what causes the shift to a more extractive politics and kicks off the long cycles of control and resistance. It is theoretically possible that public investment could provide sustained growth in technologies of resistance throughout the non-extractive phase that avoids any long-term shift in political institutions. Cycles of control and resistance could be completely dampened.

A policy attempting such dampening would focus public investment deliberately on technologies of resistance. Because by assumption the dampening is beginning at a time when institutions are fairly liberal, the private sector would have little interest in their own investments in technologies of resistance and would focus instead on higher-output technologies of control. The full burden of investment in technologies of resistance would fall to the state or to charities.

This scenario is different from the one in which we find ourselves. But interestingly, there are some examples of government investment in technologies of resistance. The Internet was developed and funded by the U.S. Department of Defense's Advanced Research Projects Agency (ARPA, and later DARPA). Tor, a network that enables anonymous communication, came out of the U.S. Naval Research Laboratory. As mentioned above, the State Department has supported the creation of subversive communications equipment.

The U.S. government funded all of these projects in part for their subversive qualities. In the case of the packet-switching research that led to the Internet, it was to produce a telecommunication system that was robust to nuclear attack. In the case of Tor and other communication systems, the goal is often to empower dissidents abroad. Other government investments (such as in solar power) may not quite so self-consciously represent technologies of resistance but do so nonetheless.

Yet it is important to underscore that little if any government investment in this regard is deliberately aimed at undermining the investing government's own power. To seriously approach smoothing the technology cycle, investment would probably need to be more explicitly focused on reducing the scope of all government power, including that of the sponsoring state. New investments in technologies of resistance would need to counteract the billions of dollars of private sector investment in growth-oriented technologies of control. It's simply unlikely that this could be achieved without deliberate effort.

Downsizing Gracefully

When the economy is highly control-oriented, there will be strong private interest in technologies of resistance that persists until centralized control over the economy decreases. This means, inevitably, that the government will have to shrink. It is an open question whether that transition can be managed smoothly.

In the private sector, downsizing has happened fairly gradually. As already noted, Choi and Spletzer (2012) show that employees per establishment fell more than 10 percent between 2000 and 2011. However, governments are less responsive than firms to

changes in the composition of technology. The re-equilibration described in this paper may not occur hydraulically, and in the short run, governments are likely to fail to respond. If that is the case, technologies of resistance will continue to accrue until there is a stark mismatch between actual and equilibrium levels of government spending and regulatory control.

In the meantime, revenue shortfalls generated by growing technological resistance may coincide with deficit spending during recessions to produce unsustainable debt that is not widely recognized as such at the time it is incurred. The clash between reality and perception may also result in violent protest or revolution as disagreement over where the power lies leads to conflict. When the time of political adjustment comes, it may be abrupt and chaotic, in the financial markets if not in the street.

This situation may be difficult to avoid. The only way to do so is for the government to preemptively downsize itself. Governments should monitor and mimic the behavior of private firms in terms of downsizing and the adoption of leaner practices. By adjusting more rapidly to the new technological environment, they can avoid some of the unpleasantness associated with abrupt political re-equilibration. Numerous politicians have promised to adopt lean, business-like techniques for governing; few have succeeded. If we observe continued leanness and efficiency gains on the part of the private sector without corresponding changes in the public sector, it would be wise to make herculean efforts to preemptively shrink the state.

Conclusion

This essay reconciles the contemporary feeling that technology is eroding power with the fact, observed by Cowen, that technology led to the growth of government in the 20th Century. Technologies of the two eras have different characteristics with respect to relative power and therefore systematically different effects on production possibilities. By focusing closely on the mechanisms of action by which technologies affect relative power, we can explain the macro trends in a way consistent with observation.

At a deeper level, I argue that technology is the rightful heir to the attention that political economists have in the past paid to geography. Development economists have long emphasized geography as a fundamental determinant of growth and institutions (e.g., Sachs and Warner, 1997). Scott (2009) shows how the geography of Southeast Asia led to a political dialectic between the anarchy of the hills and the valley states, while noting that since midcentury geography has become less important due to changes in technology.

Like geography, technology is a fundamental determinant of production possibilities and therefore of economic incentives. As humanity has increasingly overcome the limitations of geography, it stands to reason that technology has become the primary force by which the economic environment is determined. As this essay has shown, insight can be gleaned from viewing technology as a multidimensional rather than scalar construct. I hope political economists will begin to consider more fully the effect of different kinds of technology on political equilibria.

ANARCHY AND EQUILIBRIUM

Market anarchy—sometimes called *libertarian* anarchy or *free-market* anarchy—is characterized by the private, competitive provision of quasi-governmental services, including protection services, law enforcement, and dispute resolution, through voluntary market relations. It stands apart from both crude, Hobbesian anarchy, in which there are no such institutions, and various strands of left-wing anarchy, which rely on changes in human nature to prevent outcomes which proponents deem to be undesirable. The classic economic expositions of market anarchy are by Rothbard (2006 [1978]) and Friedman (1989).²⁵

Economists disagree about whether market anarchy can exist without soon devolving into government. Perhaps the most thoughtful critique of market anarchy is by Cowen (1992), who argues that anarchy based on a competitive private protection industry is not a stable equilibrium. In order to avoid inter-firm wars and descent into a Hobbesian jungle, protection firms must be able to cooperate enough to establish arbitration standards, which, in Cowen's account, take the form of an arbitration network.

²⁵ A great deal of the economic scholarship on anarchy has come from multiple generations of scholars associated with the Center for the Study of Public Choice at Virginia Tech and George Mason University, beginning with Bush (2005 [1972]). Stringham (2007) is a wonderful compendium of classic and contemporary articles and essays in the tradition of market anarchism. Powell and Stringham (2009) provide an exhaustive survey of the contemporary academic literature on the economics of anarchy.

Yet if the firms can cooperate to establish an arbitration network, they will also be able to cooperate for purposes of collusion.

The standard account of cartels suggests that holdouts, new entrants, and cheaters tend to restore competition. A private protection cartel may be immune to these concerns for two reasons. First, the arbitration network can be used to exclude new entrants or defectors by simply denying them access or discriminating against them in arbitration. Second, firms in the industry are necessarily armed and capable of committing violence to defend their clients. They are therefore well prepared to use violence to punish new entrants into the industry or cartel members who defect. Once the network becomes a cartel, it is for our purposes a government; anarchy is not a stable equilibrium.²⁶

Friedman (1994) avoids this conclusion by arguing that an arbitration network need not consist of anything more than bilateral relationships between potentially thousands of firms, which would entail no ability to collude. Cowen (1994) replies that such an arrangement would not have the power to punish firms that do not abide by arbitration agreements. To discipline renegade firms, the number of independent sources of higher-order arbitration must be small.

Caplan and Stringham (2003) dispute Cowen's argument by appealing to the differing structure of the cooperation necessary to standardize on one hand and collude on the other. In particular, they argue that the extent of cooperation necessary to standardize is low and that to collude is high. It is possible that the empirical cost of

²⁶ Without direct reference to anarchy, Cowen and Sutter (1999) make the more general point that cooperation is a double-edged sword, good or evil depending on the purposes to which it is applied.

cooperation is high enough to preclude collusion but low enough to allow standardization.

Cowen and Sutter (2005) concede Caplan and Stringham's argument as a matter of theory, but cast doubt on its empirical relevance. The standardization of arbitration procedures is not a simple coordination game as Caplan and Stringham imply. Even if standardization requires less coordination than collusion does, the difference is not so large that we can be sanguine about the prospects for market anarchy. Cowen and Sutter argue that Caplan and Stringham do not take seriously the empirical reality that government seems to be the predominant equilibrium in recent times and in most places.

While Cowen's account has arguably withstood this scrutiny, it is incomplete in at least two ways not yet noted in the literature. First, it focuses exclusively on the costs of coordination, without consideration of the corresponding benefits. In any rational choice framework, actors make decisions based on *net* benefits. They will undertake costly actions if the benefits are sufficiently high, and fail to take low-cost actions if the benefits are sufficiently low. The failure to consider the respective benefits of standardization and collusion results in a conclusion that is not informed by the assumption of rational self-interest that Cowen purports to adopt.

Second, while it is certainly true that government is empirically the most common political equilibrium, Cowen does not attempt to reconcile his argument with historical

cases in which market anarchy does appear to have been a stable outcome, sometimes for many centuries. According to a strict interpretation of his argument, these cannot exist.²⁷

In this chapter, I argue that we can conceptualize the benefits of coordinating to standardize on an arbitration procedure on one hand and of coordinating to collude on the other hand. While the benefits of standardization are straightforward, the benefits of colluding are context-dependent. Using the framework developed in the previous chapters, I show that in some cases a strict limit on the benefits of collusion may exist, and outline conditions for that value to remain low.

Next, I compare the framework to the available evidence, holding it up against both the case of medieval Iceland, the best-known instance of market anarchy, and the contemporary United States, a decidedly non-anarchic polity. Finally, I conclude by considering the future prospects for market anarchy. Could the world evolve in a direction that would make market anarchy a more conceivable equilibrium? I argue that it is at least plausible.

The Benefits of Collusion

In market anarchy, multiple profit-maximizing firms provide quasi-governmental services to consumers. These firms may also choose to cooperate with one another to create an arbitration network or to collude. They will undertake each of these cooperative activities if the expected net benefits of doing so are positive.

²⁷ Cowen is clearly aware of the existence of historical cases of stable anarchy. He cites the experiences of medieval Iceland (Friedman, 1979; Solvason, 1991) and medieval Ireland (Peden, 1977).

The costs associated with establishing an arbitration network are those of negotiating and implementing a set of procedures that define rules for arbitration and ensure compliance with these rules. The costs associated with collusion are those of using the arbitration network to exclude entrants and punish defections.

Cowen contends that if the cost of establishing an arbitration network is low, so must be the cost of collusion. Both activities involve cooperation to overcome free rider problems. Given some fixed level of “cooperative technology,” and assuming for the sake of argument (*contra* Caplan and Stringham) that both activities involve roughly the same extent of cooperation, we can take the costs to be of similar magnitude.

The benefits to the firms of both establishing the network and colluding are the additional revenues gained from customers, as well as any decrease in the costs associated with providing core services. In the case of establishing the arbitration network, it seems likely that consumers would be willing to pay more for quasi-governmental services that include pre-negotiated arbitration than for services that do not, avoiding the risk that the possible failure of *ex post* arbitration negotiations will lead to violence. A protection service that includes access to the network is a different, more valuable product than a protection service that does not. Consequently, there is a clear benefit to firms, in the form of being able to charge a higher price for service, to incurring the coordination costs necessary to join the network.

Furthermore, if pre-negotiated arbitration leads to reductions in retaliatory violence, firms will be able to provide quasi-governmental services at lower cost. Armed conflict is costly. The cost savings from avoiding such conflict is a significant benefit that

will accrue to either firms or customers, depending on the precise market structure.

Again, there is a clear benefit to firms to incurring the costs associated with the arbitration network.

If these two benefits are sufficiently large, profit-maximizing firms will undertake the investment of establishing and maintaining the arbitration network. Intuitively, both benefits seem to be of substantial magnitude. Given what we know about standardized networks in the real world,²⁸ it is more than reasonable to assume that the coordination associated with a hypothetical network of private protection firms would in fact be undertaken.

In the case of collusion, the benefits of engaging in coordination are less certain and more context-dependent. In a normal industry, we would evaluate the potential gains to collusion by estimating the consumer surplus of the market. Assuming a consolidated monopoly can perfectly price discriminate, then the potential benefits are equal to the consumer surplus.²⁹ If the monopolist cannot perfectly price discriminate, the potential benefits to collusion would be some fraction of the consumer surplus.

²⁸ Caplan and Stringham (2003) cite inter-bank networks. My framework is compatible with, and amplified by, their result on the cost side, though their work does not explain why anarchy is stable in some but not all situations. Their case studies work equally well as evidence for my theory. Modern credit card networks face highly elastic demand for their product. If fees were higher, customers would make greater use of checks or cash. Nineteenth century bank clearinghouses also faced highly elastic demand; substitutes for banknotes included greenbacks and gold or silver coins. Finally, the anomaly of sports leagues can easily be cast in terms of my framework: demand for superstar performances is relatively inelastic.

²⁹ Real-world governments engage in a variety of price discrimination techniques, such as varying taxation with income and the bundling of services unrelated to the core functions of law enforcement and dispute resolution.

Of course, the market for quasi-governmental protection services is not a typical industry. Normal industries with which we are familiar benefit from the underpinnings of law for the enforcement of contracts, the provision of jails and courts, and so on. It's doubtful that we can apply exactly the same analysis to the industry that will itself provide those services.

Yet, there are analogies between normal industries and the market for quasi-governmental protection services. As discussed in Chapter 1, in some contexts there are limits to what can be captured by the state. When metapolitical transaction costs are sufficiently low, members of the dominant coalition can capture only an amount proportional to the excess of the value of public goods over the cost of producing the public goods. If this amount is lower than the cost of coordinating exclusion and punishment of the cartel, then the private protection firms will not find it worthwhile to incur those costs to acquire lower benefits.

I focus on the subset of cases in which low metapolitical transaction costs do in fact constrain a potential state. When metapolitical transaction costs are high, the most powerful group in society can dominate the weaker group. Cowen's framework is extraneous; a market in protection services will never get off the ground because the dominant group can seize power at the outset. In cases of interest the potential cartel is constrained by the threat of metapolitical transactions. This condition, as I've argued, is met in most modern rich countries, whether democratic or autocratic.

Furthermore, as Cowen argues, for a stable equilibrium to emerge, some notion of legitimacy is necessary. "When breaking the law, a person sees the remainder of society

as siding with the established legal system, and not with himself. Without this assumption, it is difficult to explain why ... any set of political institutions has a stable core” (Cowen, 1992, pp. 251-2). It is natural to predicate this legitimacy on metapolitically-constrained political institutions.

When metapolitical transaction costs are low, the rent available to colluding protection agencies is proportional to, or under mildly stronger assumptions, strictly limited by, the value of the social surplus from the production of public goods. This value is the difference between the public’s valuation of public goods produced by the political system and the cost of producing them.

Since the state is trying to maximize the social surplus, it will produce public goods until the marginal cost equals the marginal social benefit. Marginal public goods will produce nearly zero social surplus. However, inframarginal public goods can produce many times as many benefits as they cost. All of this wedge between cost and benefit is potentially up for grabs by the colluding protection agencies.

The size of the available rent is limited by the existence of private-good substitutes. Just as in a normal market the possible monopoly rent is limited by the elasticity of demand, the gains available to quasi-governmental colluders are limited by the existence of substitutes for their services. When self-defense is a viable option, the social surplus from protection and arbitration services will be lower than when self-defense is not viable.

The constraint developed in Chapter 1 applies to net expropriation (the difference between the value of what is taken by the state and what is received from it), and the

degree to which states are constrained tends to vary cross-sectionally. On the other hand, the constraint developed in Chapter 2 applies to gross expropriation, and varies primarily intertemporally with the dispensation of technology.

When technologies are highly favorable to social control, states will be able to raise all of the tax revenue necessary to produce public goods that are socially cost-beneficial. But when technologies are highly resistance-oriented, it may be impossible for a state to acquire the full value of the available social surplus.

It is worth exploring this claim in a bit more detail. There is no reason, of course, that colluding protection agencies could not charge the same prices for service as competitive protection agencies. They could generate a social surplus equivalent in size to that generated in market anarchy. However, if they raised prices in an attempt to capture that social surplus, some individuals might no longer be willing to pay. Attempts to force them to pay could fail, due to the predominance of resistance-oriented technologies that allow them to shelter wealth.

Finally, some distinction should be made between one-time public goods and ongoing public goods. The social surplus that matters is the one associated with public goods that accrue continually or at least on a repeating basis. Take for example the case of lead paint hazard control. Gould (2009) estimates that the social surplus from removing lead paint from housing units in the United States is up to \$269 billion. Each

dollar spent on lead paint removal could conservatively produce benefits of between \$17 and \$221.³⁰

Yet this is a social surplus that will be experienced only once. Even if it is capturable by colluding protection agencies, it is not an ongoing benefit that can be used to offset the ongoing costs of coordinating punishment for defecting from the cartel. Once all of the lead paint has been removed, if the social surplus without lead paint removal benefits is lower than the costs of enforcing collusion, then the collusion would be expected to break down and the market would return to a competitive private protection industry.

To summarize, the benefits of collusion in the market for quasi-governmental services depend on:

1. The net social benefits (value minus cost) of continuously-accruing public goods, accounting for the existence of private-good substitutes, and
2. The degree to which technology allows the potential cartel to extract the full value of those net social benefits.

When those benefits exceed the ongoing costs of coordinating the collusion and punishing defection, then anarchy will not be a stable equilibrium. When the benefits fall short of those costs, anarchy will be stable.

³⁰ To be sure, most of this value is purely private, accounted for in the lifetime earnings of children raised in the affected housing units.

Exploring the Cross-Sectional Variation

It is difficult to formally test the hypothesis that low capturable social surplus from public goods makes stable market anarchy possible. While a substantial literature on cases of past and present anarchy exists, data on the social surplus from quasi-governmental services have not been developed.

Furthermore, it is not possible to compare the elasticity of demand for private security in a modern state-dominated society directly with that in an anarchist society; the general equilibrium effects of moving from state to anarchy are too large to assume that these would be comparable. And, as already discussed, the market for protection services under anarchy lacks state-provided contract enforcement, and is therefore not equivalent to markets for similar goods under the state.

To evaluate my claims, one can examine a historical case of stable anarchy and attempt to determine whether the capturable portion of the social surplus from quasi-governmental services was of especially low value. If, to the contrary, it seems that the surplus was both large and capturable, then it will be clear that my hypothesis has little merit.

It is also useful to examine a familiar instance of the government equilibrium, to determine if it is consistent with the hypothesis. After that, if the theory has survived scrutiny from these two angles, one can use it to make falsifiable predictions about the future of anarchy that could one day lead to a more definitive vindication or repudiation.

Medieval Iceland

Perhaps the most well known historical case of market anarchy is Iceland.³¹ Friedman (1979) examines the private creation and enforcement of law in medieval Iceland. According to the Landnámabók, a medieval Icelandic account of the settlement of Iceland, Iceland was discovered and settled by Norwegians by 874 AD. By 930 AD, the Althing, the national assembly, was established. For over 300 years, the law was entirely privately enforced.

There are a number of reasons to believe that the capturable portion of the surplus from quasi-governmental services would have been especially low in medieval Iceland.

First, the population of Iceland was quite homogenous. Nearly all the early settlers were ethnically Norwegian. The Íslendingabók, another medieval Icelandic source, claims that Gaelic monks were present on the island before the Norwegian settlers, although no archeological evidence exists to corroborate this story. Any Gaelic settlements that did exist were of little consequence.

Ethnic homogeneity can lead to higher levels of social trust. Landa (1981) argues that ethnically homogeneous middlemen groups provide low cost enforcement of contracts when external enforcement or vertical integration are costly or unavailable. The high degree of ethnic homogeneity of Iceland suggests that early Icelandic society would

³¹ A similar instance of anarchy existed in medieval Ireland (Peden, 1977). There, a class of jurists called brehons made the law outside of the structures of the state. There was no legislature and no state-administered justice. “Kings,” such as they were, were subject to the law and non-sovereign. Many of the features that I argue made anarchy a stable equilibrium in Iceland also applied to Ireland.

have exhibited more than average levels of social trust, leading to moderated demand for quasi-governmental services.

Second, Iceland is relatively isolated. As an island, it has no borders to protect, and its location on the fringes of Europe meant that it attracted little geopolitical attention. The first known invasions of Iceland were the Turkish Abductions, committed by Barbary pirates in July 1627. While the King of Norway and some other foreigners exhibited some influence on Iceland during the anarchic period through vassalage, the external threat was relatively low.

The lack of an external threat correspondingly depresses the possible value of public goods provided by either a network of protection firms or a state. National defense is frequently cited as the quintessential public good. The fact that it appears to have been of little to no value in medieval Iceland is therefore evidence that the benefits to collusion between suppliers of protection services would have been low.

A third factor that would have influenced the available social surplus in Iceland is population density. The Landnámabók lists 534 original settlers and about 3500 people in total. It is difficult to know how the population grew over time, but even with generous estimates of population and ruling out glaciated land, Iceland would have had a lower population density than nearly every modern nation.

This low density suggests that Icelanders would have interacted with the same few people on a repeated basis. They would rarely have economic dealings with strangers. These repeated dealings would have been a strong basis for reliance on reputation instead of on quasi-governmental services for protection in economic and

other disputes.³² The existence of this substitute for formal legal protection services is another indicator of low social surplus from the public goods associated with the legal system.

Fourth, in this period, mobility was high. The North Atlantic was a vast frontier. Icelanders and Norwegians discovered Greenland within a dozen years of the discovery of Iceland. Leif Ericson, who is credited with the European discovery of North America, was born in Iceland around 970.

As a preindustrial society, by modern standards Iceland had little fixed capital. It seems clear that the residents of Iceland during this period were familiar with seafaring; while hard data is unavailable, much Icelandic capital may have been in the highly mobile form of ocean-going vessels.

The combination of an available frontier and mobile capital suggests it would have been difficult for a cartel of quasi-governmental firms to capture the social surplus they create. In a competitive market, Icelanders may have been content to pay the market price for protection. But attempts to raise this price through collusion would likely have resulted in greater exit to the frontier.

Fifth, by modern standards, if not by standards of the time, medieval Iceland was desperately poor. Wages net of room and board were as low as zero during the settlement period (Friedman, 1979, p. 411). Although wages were higher during later centuries,

³² For a number of case studies, spanning multiple time periods, of how reputation mechanisms can promote economic activity without law, see Klein (1997).

during which Iceland remained relatively anarchic, the cost of subsistence represented a large fraction of income.³³

As discussed in the last chapter, immediate consumption is one way that wealth can be sheltered from expropriation. The fact that many Icelanders in fact immediately consumed their income out of the necessity of subsistence is further evidence that it may have been difficult for colluding protection providers to extract more revenue.³⁴

Finally, the settlement of Iceland was driven by factors that suggest a systematic selection effect. According to the Norse sagas, from 866 to 872, Harald Fairhair engaged in a series of conquests in Norway that brought the entire country under unified rule for the first time. A large number of his opponents took refuge in Iceland. It is unclear if they were malcontents who left voluntarily or if they posed a threat to Harald and were forced to leave. Either way, the early inhabitants of Iceland were systematically predisposed to a belief in or preference for autonomy.

Preferences and ideology can play a role in the demand for quasi-governmental services. The bald invocation of preferences and ideology to explain the survival of anarchy is, as Cowen states, a *deus ex machina* (Cowen, 1992, p. 252). But insofar as real

³³ It is important to underscore that that the poverty of premodern civilization is not sufficient to produce anarchy. To the contrary, Wittfogel (1957) shows that absolutism is possible in premodern societies when large-scale, government-managed waterworks are necessary.

³⁴ Interestingly, near the end of anarchy in Iceland, in a tumultuous period known as the Sturlung Era, some Icelanders who were considered very rich amassed fortunes as large as 2500 years' wages (Friedman, 1979, p. 413). The fact that this buildup of wealth far above subsistence coincided with the decline of anarchy in Iceland is also consistent with my framework. By the Sturlung Era, it may have become rational for suppliers of protection to try to collude to seize some of this wealth.

factors generate selection effects that lead to a population with broadly anti-authoritarian preferences, theory should allow this minimal reliance on preferences. Faced, at least initially in Iceland's history, with a fiercely autonomous population, potential colluders might have found it difficult to extract the social surplus.

In sum, a combination of the above factors indicates that the existence and stability of anarchy in medieval Iceland is consistent with my theory. The surplus generated by the production of public goods would have been relatively small and difficult to capture. As a result, it would not have been profitable for protection providers to collude to attempt to capture it. Nevertheless, as Friedman documents, they were able to coordinate for purposes of providing laws and dispute resolution mechanisms.

Modern United States

The present-day United States could hardly be more different from medieval Iceland. Whereas Iceland featured mostly low-value economic transactions between small numbers of actors who likely knew each other, the American economy benefits from countless high-value, mostly-anonymous transactions. In the wealthiest economy in the world, the rule of law, imperfect though it may be, creates a lot of value. Much of this value is capturable by the state.

In contrast with Iceland, which had few if any external threats, the United States is heavily embroiled in world affairs and at risk of terrorist and other foreign attacks. Consequently, national defense is a public good of substantial value.

Other public goods also create a large social surplus. As an industrial society, the United States has a greater need for pollution regulation than did medieval Iceland.

Climate change also creates an opportunity for the government to add social value through carbon taxation or regulation.

Another major difference between the United States and medieval Iceland is population density. The World Bank estimates population density in the United States to be 35 per square kilometer. Modern Iceland's population density is 3 per square kilometer, and of course, medieval Iceland would have been yet more sparsely populated.

As a practical matter, this density means that modern Americans will interact with many anonymous strangers every day, making pure reliance on reputation a poor alternative to government protection. To some extent this effect is mitigated by lower costs of information. For instance, credit rating agencies leverage reputation to help their clients circumvent the costs of collecting small debts through the court system. This is made possible by technology that did not exist in medieval Iceland. Notwithstanding improved information technology, the greater anonymity that accompanies the higher density in the United States would make forgoing protection services a costly strategy.

Whereas Iceland had an ethnically homogenous population, the United States is one of the most heterogeneous countries in the world and in history. While America has arguably tolerated this diversity relatively well thanks to the integrative effect of institutions like the military and religion, Putnam (2007) shows that within the United States higher ethnic diversity leads to lower levels of social trust, even with respect to members of one's own race. The US is also burdened with the historical legacy of race-based slavery, of the genocide of the indigenous population, and of the internment of the Japanese during World War II.

The lower levels of social trust that correspond to ethnic diversity make it unlikely that trust could substitute for formal governance in the United States. As a result, the benefits of formal governance are likely capturable by government.

Mobility and exit do not provide a strong check on government capture of the social surplus. Unlike Iceland, the United States does not have an obvious available frontier to which its citizens could escape if the price of quasi-governmental services rose. Virtually all the land on Earth has been claimed.

Furthermore, huge amounts of fixed capital would have to be abandoned in order to exercise an exit option. The BEA estimated that the current-cost net stock of private structures alone was worth \$31.6 trillion in 2015, or approximately 175% of GDP. While any one individual wishing to leave the United States can sell fixed assets without a loss, any systematic outflow of population would entail large costs in terms of forgone fixed capital value.³⁵ On this margin as well, we can expect the United States to have more capturable demand for quasi-governmental services than Iceland.

Economic arrangements in the United States are highly intermediated. There are 5,210 commercial banks in America. Through the Bank Secrecy Act of 1970, the government requires banks to assist the agencies in detecting money laundering and requires them to report suspicious activity. The government is quite aware of the power that this arrangement gives them. From 2013 to 2015, the Department of Justice and the Federal Deposit Insurance Corporation engaged in “Operation Choke Point,” using

³⁵ Caplan (2001) shows that Tiebout competition is limited because tax capitalization of property values reduces land-owners’ ability to evade taxes through moving.

pressure on banks to deny access to financial services without due process to a variety of industries, from firearms sales to pornography.

Leverage of intermediaries, not just financial, but also potentially communication service providers and electrical utilities, provides a way for the government to efficiently control large amounts of economic activity. Consequently, a large portion of the social surplus is available for capture by the state.

Finally, in contrast with Iceland, there is no selection effect in operation today that makes American preferences or ideology a bulwark against an exploitative government. Such an effect may have been operative during the initial European colonization of America; in any case, it is not any longer.

Overall, the factors discussed above suggest that not only does formal governance create a large social surplus in the United States, but a great deal of it is capturable by the state. This is consistent with the observed equilibrium: the United States has government, not anarchy. The analysis implies that if the United States were to adopt market anarchy under present conditions it would devolve back to government. Anarchy would not be stable.

Implications for the Scale and Scope of Government

My analysis suggests that states tend to form when there are large, directly or indirectly appropriable rents available from the production of public goods. Conversely, anarchy is stable when large, appropriable rents don't exist, subject to the caveat that society must face a metapolitical constraint as discussed in the first chapter.

This framework can also be applied to the contours of the state as well as to questions of its existence. Even in today's state-dominated societies, governments do not have total control of all aspects of human relations. Functionally, we are anarchic on some margins.³⁶ Perhaps most obviously, anarchy continues to operate at the international level, both in relations between states and to a considerable extent in international commerce. These contours can be seen as a function of the scale or scope of government that maximizes the appropriable value of public goods.

That is, assume that the efficiency with which public goods are produced varies with the scale of government, in terms of territorial extent, economic size, or population size. Assume also that the appropriability of social resources varies with scale. Weighting the efficiency of public goods production by the appropriability of social resources yields at least one scale that maximizes the value that a metapolitically constrained government can appropriate per unit of scale. My claim is that states will tend toward that scale.

Consider the degree of international anarchy as reflected in the number of independent sovereign states. Alesina and Spolare (1997) note that the efficient size of countries is a decreasing function of heterogeneity. When a population is more diverse, a smaller state will provide higher value per person due to a better matching of government services with preferences. On the other hand, larger scale can spread the cost of public goods over a larger base. One public good of great importance is market access—when trade barriers exist, there are benefits to large states, because they come with a sizeable

³⁶ Cuzán (1979) goes so far to argue that because the different branches of government relate to each other without an external arbiter, they stand within an anarchy relation to one another. Therefore, on some level, we never leave anarchy.

internal market. When international markets become integrated, this benefit goes away, and the optimal size of countries becomes smaller.

Alesina, Spolare, and Wacziarg (2000) test the hypothesis that country size is responsive to the degree of globalization. They find that it is, by both population and GDP measures of size.³⁷ This finding is consistent with my claims. As globalization increases, one particular public good (market access) is more efficiently produced and resources no less easily appropriated in smaller political units. We should therefore expect metapolitical constraints to lead to smaller countries as globalization proceeds.

A similar calculus can be done for the scope of government. If by monopolizing a marginal activity the government can increase the resources it can appropriate, then it can be presumed that it will expand into that activity. When physically appropriable resources are abundant, the government will be constrained by the surplus from public goods production. It will expand into activities that increase that surplus without qualification. When appropriable resources are scarce, then it will expand into activities that create additional welfare in appropriable forms, or transmutes existing welfare into appropriable forms.

International trade remains an area that is privately ordered. The vast majority of dispute resolution in trade is provided through private arbitration by advance mutual

³⁷ In addition to predicting that country size negatively correlates with globalization, Alesina and Spolare (1997) predict that democracy leads to inefficiently many independent countries. There does not seem to be any evidence that democracies are smaller than autocracies; if anything, the data suggest the opposite. This is yet another case in which expectations about differences between democracy and autocracy are confounded by reality.

agreement, a practice similar to the form of law envisioned by market anarchist thinkers. We should expect states to monopolize the practice of dispute resolution in international trade if such monopolization adds significant value or if it creates additional appropriable resources.

There is little reason to think that states taking over international commercial dispute resolution would add much value. Leeson (2008) examines the role of private arbitration in international trade, and particularly the degree to which trade benefits from formal enforcement of arbitration decisions via the New York Convention (NYC). He finds that bilateral NYC ratification produces a 38 percent increase in the volume of trade, all things considered a modest effect.

Formal enforcement of private arbitration judgments is a less dramatic step than monopolization. The modest effect of formal enforcement, combined with dramatic growth in the volume of global trade over the last few decades, suggests that private arbitration works quite well. Traders have the option of using state courts even without monopolization, yet they prefer to use private alternatives.³⁸ Private arbitration provides a range of flexible options that can be tailored to fit the needs of a particular context (Mattli, 2001); state-run litigation procedure tends not to be as flexible. These factors suggest that the likely effect of state monopolization would be negative.

³⁸ To be sure, one of the challenges facing international commercial dispute resolution is fear that a state court would be partial to the company located within its jurisdiction. It is conceivable therefore that private arbitration could be inferior to state courts, but selected anyway because parties cannot agree on which state court to use.

In addition, it is unlikely that state monopolization of dispute resolution would render social resources more available to appropriation by the state. Consequently, the fact that we do not observe significant attempts by governments to monopolize the provision of international dispute resolution is consistent with this chapter's framework.

Whether we look at international trade or international relations, it is clear that the state has limits. Anarchy prevails at some margins. As I've shown, a general theory of when anarchy is stable can help illuminate the precise contours of state power against the backdrop of global anarchy.

Conclusion: Future Prospects for Anarchy

While I agree with Cowen on the prospects for anarchy in the present-day United States, his theory is presented as an impossibility theorem: If protection firms can provide law and order, then they can also collude. As a result, market anarchy is not possibly stable. As I have shown both theoretically and historically, this presentation goes too far. At different places and times, governments have varying ability to create and capture the value of public goods. As a result, there may be cases where it is rational for protection firms to produce standardized law but not to collude and form a government.

Instances of stable market anarchy could exist in the future as well as in the past. While even anarchists should hope that we do not return to the poverty of centuries past, it is not necessarily the case that medieval modes of living are the only ones consistent with stable anarchy. It is worth briefly exploring how the future could evolve to make market anarchy a plausible political outcome in my framework without entailing medieval levels of poverty.

Our current world order made up of strong nation-states is a historical outlier. The system of Westphalian sovereignty was established in Europe in 1648, and was extended to most of the globe only within the last century. Arguably, the system peaked in the 20th century with totalitarianism, the World Wars, and the Cold War.

Williams (2008) contends that the rise of violent non-state actors (VNSAs) in the 21st century is a function of the growing weakness of states.³⁹ States are increasingly facing crises of legitimacy and capacity. Many citizens primarily identify with ethnic, religious, or economic groupings ahead of the nation. Globalization has also facilitated the rise of VNSAs as states have lost exclusive control over the arms trade.

More evidence of the peaking of the nation-state is available from the number of sovereign states. The number of independent countries with a population of more than 500,000 rose from 54 in 1900 to 167 in 2015. This increase is in addition to the dozens of active separatist movements around the globe as well as increasing numbers of autonomous regions.

³⁹ Williams distinguishes between several types of VNSAs, including warlords, militias, paramilitary forces, insurgencies, terrorist organizations, and criminal organizations and youth gangs.

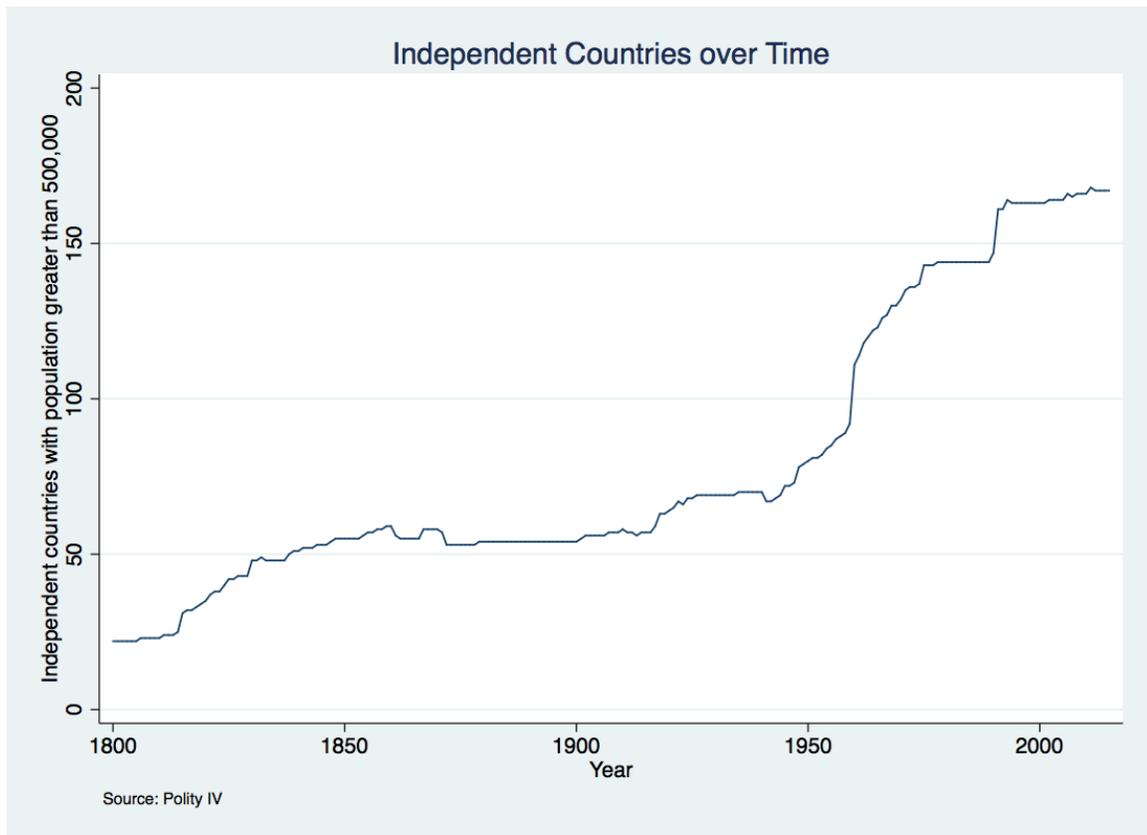


Figure 2: Independent Countries over Time

In short, political power has become less absolute and more polycentric since the end of the Cold War and the rise of the Internet. In that way, at least, the world has become more medieval.⁴⁰ As political evolution proceeds, what must happen for anarchy to prevail in at least some parts of the world?

I have argued in Chapter 1 that, in at least rich countries around the world, governments are metapolitically constrained. These governments cannot seize arbitrary

⁴⁰ Kobrin (1998) makes this case at greater length, arguing that “neomedieval,” overlapping, polycentric, ambiguous power relations characterize the postmodern digital economy.

amounts of social wealth. Instead, they are limited to extracting an amount proportional to the social value of what they create through public goods. For anarchy to be stable, this constraint must continue to hold, a condition that is all the more likely if polities continue to fragment.

The dispensation of technology, too, represents a constraint on the state. In Chapter 2, I have argued that technology is now moving in the direction of resistance to centralized control. If this technological constraint continues to tighten, then combined with existing trends toward the devolution of power, stable anarchy could be possible in some parts of the globe.

Technologies under development can take resistance to centralized control much further than is possible under the status quo. Perhaps the most publicized technologies of resistance are peer-to-peer cryptocurrencies, which enable final settlement of value transfers over the Internet without an intermediary. As discussed above, an intermediated financial system gives the government a great deal of control over economic activity. If cryptocurrencies came to be widely adopted, this control would necessarily decrease.

Relatedly, cryptocurrency technology can be used to provide “smart contracts,” software protocols that enforce the performance of an agreement. If adopted, smart contracts will obviate the need for recourse to the law in some domains, lowering the value provided by law as a public good. Furthermore, smart contracts may allow the enforcement of agreements that governments would not allow to be enforced by law. Again, this decreases the degree of government control.

The price of collecting, transmitting, and analyzing information continues to fall. As this trend continues, the social value of government regulation will decline. Tabarrok and Cowen (2015) call it “the end of asymmetric information.” Abundant information not only makes the rationale for a significant fraction of government regulation obsolete, it also provides substitutes for legal recourse. For example, better information can make reputation mechanisms operate more effectively and in a wider range of domains. Combined with technologies like mixed reality goggles and facial recognition, it may be possible to access a real-time visual overlay of identity and reputation information, providing strong reputational protection for previously anonymous or weakly identified economic interactions. Reliance on reputation rather than the law diminishes what a metapolitically constrained government can capture.

More and more capital is becoming intangible, and therefore capital mobility is increasing. American investments in intellectual property products, which include software and research and development, have risen to about a third of private nonresidential fixed investment, from below 10 percent in 1950.⁴¹ Human capital, as measured by years of schooling and returns to education, has also increased monotonically since 1950 in the United States (University of Groningen & University of California, Davis, 2016). Software, ideas, and human beings are all significantly more mobile than factories. Higher proportions and degrees of capital mobility make capturing resources by force more difficult.

⁴¹ In the BEA’s income and product accounts, investment in intellectual property products is a proper subset of nonresidential fixed investment.

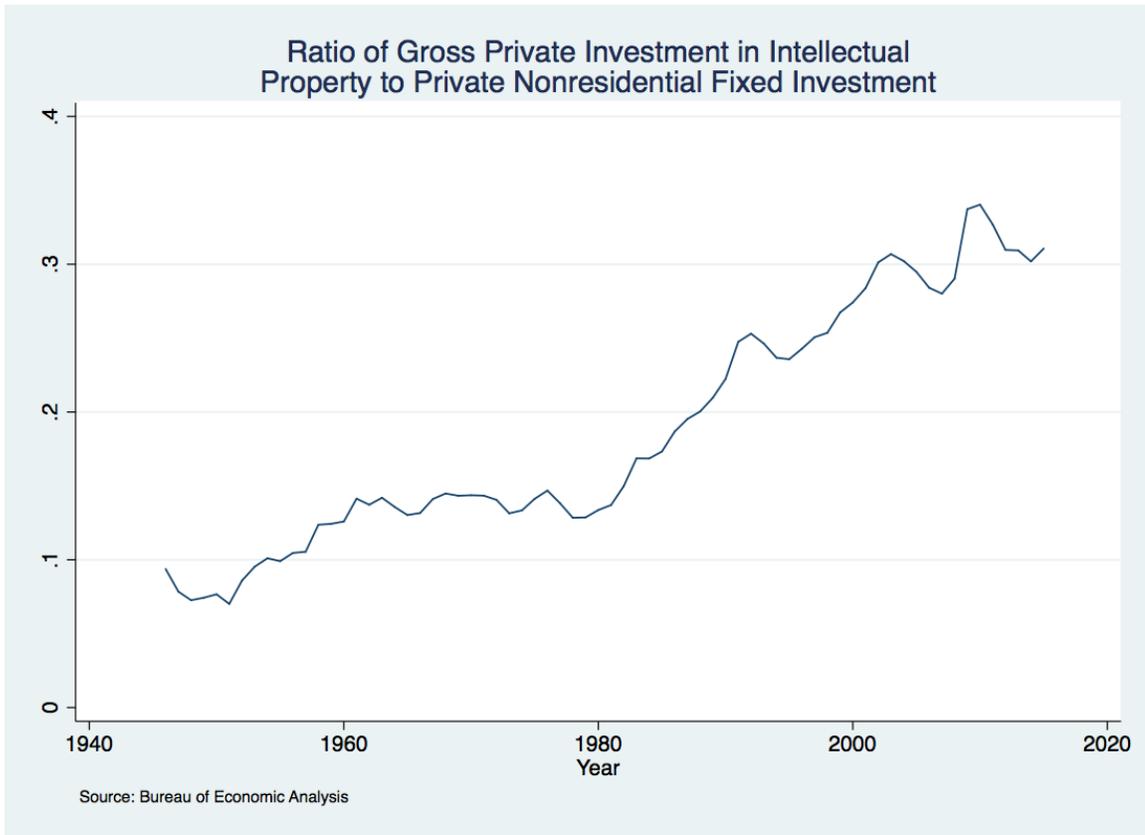


Figure 3: Ratio of Gross Private Investment in Intellectual Property to Private Nonresidential Fixed Investment

What is more, this mobile capital may have some new frontiers to which to flee. The surface of the Earth is 70 percent water, and work is now being done to colonize the oceans. Unbelievably, Elon Musk wants to send humans to colonize Mars beginning in 2024. More mundanely, the Internet is a frontier. People can choose and are choosing to spend greater fractions of their lives online, for the most part free from governmental interference, and using encryption when governments do try to censor or regulate. These new frontiers could provide a further check on governments' ability to regulate and capture economic activity.

All told, this confluence of historical trends and current developments in technology is unlikely to result in statelessness over the whole globe. But it is well within the realm of possibility that as power devolves in an information-rich, mobile, economically unmediated world, there will be non-trivial pockets of stable market anarchy. With a lower baseline of state power on average, a higher fraction of the cross-sectional variation could reach the zero lower bound. Continued research on the political economy of anarchy is warranted so that we might understand this new state of affairs should it arrive.

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