Political Competition over Property Rights Enforcement*

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Abstract

I study what level of tax-financed property rights enforcement societies choose in elections. Restrictions on who can run for office define a political elite. The elite selects two candidates who then propose enforcement levels and tax rates voters can choose from. The election winner keeps the budget surplus but has to take into account the loser's outside option, which thus determines the election outcome. Lifting restrictions on who can run for office may benefit society more than lifting restrictions on who can vote.

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1 Introduction

The security of property rights matters for economic outcomes (see, e.g., Knack and Keefer (1995), Hall and Jones (1999)). Why does it vary across countries? Much of the existing literature on property rights focuses on policies chosen by politically powerful groups (see, e.g., Acemoglu (2003, 2006, 2008)).[1] However, most countries today choose policies based on how their population votes. In 2000, 170 countries held regular elections with a mean of 98.5% of the adult population eligible to vote.[2] But, as North et al. (2006) argue, "elections do not mean the same thing" in Argentina, Mexico, Russia, and the United States (pp. 66-67).[3] Given well-defined property rights, what determines the level of their enforcement chosen in elections? Why might this choice vary across countries with similar economic fundamentals?

North et al. (2006) emphasize the role of political competition in how elections work (p. 67); and elections are not equally competitive across countries. For the year 2000, of those 170 countries with regular elections, 123 allow for direct comparison with Polity IV's measure of the *Competitiveness of Executive Recruitment*. In only 65 of them, executives were chosen by "election," in 27 by "selection," in 31 by an intermediate selection process. The least competitive category called "selection," as opposed to the most competitive category called "election," includes, e.g., "rigged, unopposed elections" as well as "selection within an institutionalized single party" (see Marshall et al. (2016), p. 21). In this subset of 123 countries, Polity IV's *Competitiveness of Executive Recruitment* thus effectively measures the competitiveness of elections. The correlation of this measure with the World Bank's governance indicators *Rule of Law* and *Control of Corruption* is 0.55 and 0.52, respectively.[4] That is, more competitive elections are positively correlated with perceptions of more secure property rights.

This paper emphasizes one aspect of political competition—broad access to political activities. Societies with similar economic fundamentals may choose different outcomes because they have different alternatives to choose from. These alternatives differ due to variations in restrictions on who can be active in the political arena and run for office. Such restrictions may be formal property or educational qualifications for office as prevalent in history (see, e.g., Miller (1900)) as well as the importance of connections or status established by economic success or inheritance as still prevalent today (see, e.g., Dal Bó et al. (2009)). The latter type of implicit restrictions encompasses the existence of narrow political elites in countries that hold elections in which virtually all adults can vote.

[1] For a prominent example focusing on agency problems, see Acemoglu and Verdier (1998).

[2] Data from Paxton et al. (2003), via Bruce Moon's web page: `http://www.lehigh.edu/~bm05/democracy/suffrage_data.html`. The authors require evidence of regular elections but do not judge their fairness (p. 95).

[3] See, e.g., Diamond (2002) on various concepts and classifications of electoral regimes and their prevalence.

[4] Polity IV data: Center for Systemic Peace, `http://www.systemicpeace.org/inscrdata.html`, variable *xrcomp*; Governance data: The World Bank, `http://info.worldbank.org/governance/wgi`; p-values $< 10^{-9}$.

In the model I present in Section 2, some individuals can "steal" from others who produce with heterogeneous productivity. Here, I think of stealing as a synonym for unproductive and purely redistributive activities such as corruption, extortion, fraud, or outright theft. I assume that the act of producing output establishes the right to consume it and to exclude others from consuming it. Enforcing this right against those who steal makes property rights secure. I focus on public enforcement that is financed by taxation.[5] As an extreme case, one can think of a kleptocratic state lacking well-defined property rights assignments as one in which such rights are well-defined and assigned to producers, but severe taxation (or, expropriation) and unimpeded stealing prevail (see, e.g., Acemoglu et al. (2004)).[6]

The level of enforcement regulates how much can be stolen. It is chosen by society in a political process. Political institutions determine how many individuals from which groups in society can be active in the political arena, i.e., can run for office. Two individuals from this politically active population choose to become candidates in electoral competition. They each propose a tax rate and a level of enforcement. The population votes over the proposals to decide the outcome. If political activity is restricted to those five individuals with the highest income—instead of open to five million individuals with many different income levels—then the population constitutes a large non-elite group that votes over policies proposed by members of a narrow political elite.[7] If not everybody can vote, then voters themselves can constitute a narrow elite within which, potentially, not everybody can run for office.

I show in Section 3 that a strategic interaction in the political game shapes society's choice by determining the set of alternatives voters can choose from. The regimes the candidates propose for the election depend on the loser to-be's outside option, which is characterized by their productivity. Therefore, different losers to-be, with different productivity, induce different alternatives for voters to choose from, and thus different outcomes. Two initially otherwise identical societies with different election losers choose different levels of enforcement and see different levels of property rights security.

In line with the correlations mentioned above, the model further suggests that we are more likely to see more secure property rights in societies with more competitive political environments.[8] Allowing five million individuals to be politically active and run for office, rather than only those five with the highest income, induces a favorable set of alternatives for voters to

[5]See, e.g., Besley and Persson (2009, 2010) on state capacity for taxation and property rights enforcement. Herrera and Martinelli (2013) study investment in state capacity in oligarchic and democratic societies.

[6]Also see, for example, Olson (1993), Moselle and Polak (2001), and Konrad and Skaperdas (2012).

[7]Bidner et al. (2014), for example, rationalize the existence of elections in such environments.

[8]More generally, Besley et al. (2010) argue that competition may lead political parties to choose policies that further economic performance and growth. They find evidence supporting their argument in U.S. data. Padovano and Ricciuti (2009) find similar results using data from Italy. Svaleryd and Vlachos (2009) study the effects of both political competition and media coverage on political rents in Sweden.

choose from. At the same time, in equilibrium, decisive voters are those who steal. Given two alternatives, as long as the qualified electorate admits an equilibrium (and delivers neither anarchy nor a dictatorship), allowing more people to vote does not change the decision. It follows that lifting restrictions on who can vote only has an effect if it coincides with lifting restrictions on who can run for office. This prediction arises because the economic mechanisms at work in models of the extension of voting rights, such as Acemoglu and Robinson (2000, 2001), Lizzeri and Persico (2004), and Gradstein (2007), are absent here.

The model allows us to study situations both when decisions are made entirely in narrow political elites and when elections are held in which virtually all adults can vote. It offers an explanation for different outcomes in societies in which everybody can vote, without resorting to differences in economic fundamentals. If more productive projects in the model are interpreted to be positively correlated with more education or greater wealth, then the model offers an argument for lifting landholding, wealth, or literacy requirements for political activities (see, e.g., Miller (1900); also see Engerman and Sokoloff (2005) on voting rights).

My setup shares a selection stage with citizen-candidate models introduced by Osborne and Slivinski (1996) and Besley and Coate (1997). However, I assume that candidates can commit to electoral platforms because they prefer implementing outright dictatorship once in office.[9] I therefore have a second stage in which political competition gives rise to a second strategic interaction that would be absent otherwise. Messner and Polborn (2004), for example, model a set of potential candidates for office that differ in competence in office and their exogenous opportunity cost or office benefits. In my model, potential candidates differ with respect to the productivity of the project they execute when not in office. The rents from holding office and the office holder's opportunity costs arise endogenously from the electoral competition. In equilibrium, one candidate runs and loses with certainty to "dictate" the outcome. While Messner and Polborn (2004) rationalize some restrictions on those who can run for certain positions, my results suggest that, in the context of this paper, restrictions should be lifted.

Acemoglu (2005) models a ruler that raises taxes from citizens to spend some of the receipts on a productive public good and consume the rest. The ruler's policy choice is constrained by either an opportunity to avoid paying taxes or the threat of replacement in the future. By contrast, I focus on constraints arising from competition in the political arena, however intense it may be, and their effects on societies' choices through the alternatives available to voters. The intuition of the outcome of the political game here is related to the one described by Gersbach (2009) in a citizen-candidate model with a focus on politician remuneration. In his environment, candidate politicians may competitively propose their wage in office. In

[9] The model generates in-office rents from weak institutions and kleptocratic states nonetheless.

equilibrium, a more competent candidate collects a rent determined by the exogenous competence of the competitor. The proposed wage is just high enough to make the voters indifferent between the candidates. In my model, the candidate with the less productive project collects a rent that depends on both the productivity of the competitor's project and the endogenous policy outcome. The election winner makes the election loser indifferent between being in office and not being in office. Finally, Polo (1999) studies under what conditions the winner of a two-candidate election can capture political rents. He focuses on uncertain voter preferences over candidate attributes. By contrast, I focus on strategic interactions arising from candidates' outside options and restricted access to the political arena.

I describe the model in Section 2, present its predictions in Section 3, and discuss my assumptions and the robustness of the model predictions in Section 4, before I conclude.

2 The Model

In this section, I describe the economic environment, the political process, and the timing. For the sake of simplicity, some important aspects are missing from the model. I discuss the most salient assumptions and missing aspects and the predictions' robustness in Section 4.

The Environment. There is a large finite number $p + a + 1$ of risk neutral agents. Except for one idle individual, each agent belongs to one of two mutually exclusive groups: there are p producers and a appropriators. I assume that $p - 2 > a > 0$. That is, this society has (at least three) more producers than appropriators. I discuss the case of $p - 2 < a$ in Section 4.

Each of the p producers has one of p projects with publicly observable, heterogeneous productivities collected in the set $\mathcal{W} = \{w_1, w_2, \ldots, w_p\}$, where $w_{i+1} > w_i > 0$ for all $i = 1, \ldots, p-1$. To simplify notation, I normalize aggregate output to one, i.e., $\sum_i w_i = 1$. I often refer to a specific producer using the productivity of the associated project. A project produces a quantity equal to its productivity of the consumption good. Producers execute their projects inelastically and earn the proceeds accruing to it, say w. They then pay proportional taxes with rate $\tau \in [0, 1]$ on that income w and are expropriated of a fraction $\theta \in [0, 1]$ of their after-tax income $(1 - \tau)w$. For simplicity, neither enforcement nor appropriation activities target specific groups. That is, when producing w, a producer consumes $(1 - \theta)(1 - \tau)w$. The quasiconcave function $\varphi : [0, 1]^2 \to [0, 1]$, given by $\varphi(\theta, \tau) = (1 - \theta)(1 - \tau)$, determines exactly what fraction of their output producers can consume. It thus captures the security of property rights, both against private agents and the state. The expression $(1 - \theta)$ represents the secure fraction of after-tax income and thus the level of property rights enforcement. Relative to the implemented enforcement, after-tax income itself, and thus the expression $(1 - \tau)$, represents the extent to which the state, i.e., the office holder, grabs resources.

The a appropriators engage in a sector for unproductive and purely redistributive activity. That sector appropriates a fraction $\theta \in [0,1]$ of all after-tax income in the economy before it can be consumed. The focus is on appropriation activities that do not require any specialized ability, as opposed to potentially skill-intensive activities such as, e.g., financial fraud. Each appropriator receives some fixed nonzero share of all appropriated resources so that the shares add up to one. Equal shares are a special case. Unequal shares reflect the varying effectiveness of appropriation activities as well as, possibly, connections to and roles within a corrupt elite.

Enforcing the property rights to a fraction $(1-\theta)$ of after-tax income requires society to incur a cost $g(1-\theta)$. The function $g : [0,1] \to \mathbb{R}_+$ is twice continuously differentiable, strictly increasing, with derivative $g'(1-\theta) > 0$, and strictly convex, with second derivative $g''(1-\theta) > 0$, on the interior of its domain. Perfect enforcement is unaffordable, $\lim_{(1-\theta)\to 1} g(1-\theta) \geq 1$, no enforcement is costless, $g(0) = 0$, and low enough fixed costs are possible, $1 > \lim_{(1-\theta)\to 0} g(1-\theta) \geq 0$.

The Political Process. Society chooses the secure fraction $(1-\theta)$ and the tax rate τ to raise the funds to pay for it in a political process. At the outset, a number $n \leq p$ of producers associated with the most productive projects are presented with an opportunity to actively engage in the political arena. They belong to the set of potential candidates, $N = \{w_1^N, \ldots, w_n^N\} = \{w_{p+1-n}, \ldots, w_p\} \subseteq \mathcal{W}$, that can choose to run for office. Appropriators and the idle individual can never run for office. This assumption captures the idea that elite status, political and otherwise, is determined by economic success and its sources, as reflected by the associated project, and the implied visibility and involvement in relevant networks. Formal property or educational qualifications for office (see Miller (1900)) tend to favor those best equipped for economic success. In fact, causality may well be reverse: in many societies, being a member of the elite might be a prerequisite for economic success.

Given N, there may be an election that decides who wins the office. At most two candidates can run for office, and running is costless. All agents in N decide whether or not to run. The productivities of the projects of all agents in N are common knowledge to all agents in N. Let $N' \subseteq N$ be the set of potential candidates who choose to run. If there is no candidate for office, then the "anarchy" regime is that no taxes are collected and no enforcement is put in place: $(\theta^a, \tau^a) = (1, 0)$. If there is only one candidate, then that agent becomes a dictator and enacts some regime (θ^d, τ^d). If there are exactly two candidates, then the two of them run for office in an election. If there are more than two potential candidates that want to run, then two of them are drawn at random, with equal probability. I refer to the candidates as w_L and w_H, where $w_L < w_H$.

All noncandidate producers and appropriators can vote in the election. Candidates and the idle individual cannot vote. This assumption simplifies the exposition but is otherwise immaterial. The candidates compete by simultaneously announcing and committing to enact a regime, i.e., a proportional tax rate τ and a level of enforcement $(1-\theta)$, where $(\theta,\tau)\in[0,1]^2$. I refer to the regimes the candidates w_L and w_H propose as (θ_L,τ_L) and (θ_H,τ_H), respectively.

After the proposals have been announced, a preference shock realizes. With a small probability $\varepsilon>0$, voters that are indifferent between the proposed regimes prefer a candidate that is public-spirited in the following sense:[10] Given the opponent's proposal, the maximum in-office payoff that the candidate can get from any regime that has a positive probability of winning the election is lower than the payoff from losing the election, which is this candidate's opportunity cost of getting into office. That is, given the proposed regimes, with probability ε, voters that are indifferent between the regimes vote for the candidate whose payoff from losing the election is strictly higher than the highest possible in-office payoff this candidate could get from a regime that has a chance to win the election. If both or none of the candidates are public-spirited in this sense, then no candidate has an advantage. With probability $(1-\varepsilon)$, only the proposed regimes matter to voters. Then, voters vote sincerely for one candidate or abstain if they are indifferent. The candidate that receives the majority of all casted votes wins the election. Ties are split with a fair coin flip. The assumption that $p-2>a$ implies that the majority of voters are producers.

The election winner becomes society's top executive, serves as full-time office holder, and cannot execute the project. I discuss this assumption in Section 4. The office holder's payoff $\tilde{w}$ equals total tax receipts minus the cost of implementing $(1-\theta)$. It is not subject to taxation or appropriation. The idle individual, who has no income otherwise, takes over and executes the election winner's project, at the expense of being subject to taxation and appropriation. The role of this assumption is technical in nature as it lends tractability without having to impose more structure. I discuss the details and possible economic interpretations in Section 4. The election loser executes the productive project, given the regime enacted by the winner.

The Timing. Table 1 summarizes the timing. At the outset, the potential candidates are fixed. They decide whether or not to enter the electoral competition to determine two candidates that run for office. Then, the two candidates propose regimes and, after the preference shock is realized, the qualified electorate votes over the alternatives presented. The majority winner enacts the proposed regime. Thereafter, producers execute their projects, generate income, and pay taxes. Then, enforcement is implemented. After that, the appropriation sector appropriates and redistributes resources from producers. Finally, all agents consume.

[10]This shock does not affect the characteristics of equilibrium of this stage. See Section 4 for a discussion.

Table 1

Stages and Timing

Stage 1: Selection Game	Stage 2: Political Game	Stage 3: Underlying Economy
1.) The set N is fixed.	1.) w_L and w_H propose regimes.	1.) Producers produce, pay taxes.
2.) The agents in N	2.) The shock realizes.	2.) Enforcement is set up.
select candidates	3.) The office holder is elected.	3.) Appropriation takes place.
w_L and w_H.	4.) The regime is enacted.	4.) All agents consume.

3 Analysis

The economy evolves in three stages: the selection game given a set of potential candidates, the political game given two candidates, and the underlying economy given a regime. I take the economic fundamentals summarized by the set of project productivities $\mathcal{W}$ and the enforcement technology g as given. The equilibrium concept is subgame perfect equilibrium: All potential candidates' decisions to run for office are best responses to all other potential candidates' decisions, taking as given that each candidate's regime proposal in the political game is a best response to the other candidate's regime proposal. I solve the model backwards. I first describe the underlying economy given any regime (θ, τ) and the outcome under anarchy, dictatorship, and direct democracy. Then, I study the choice of (θ, τ) in the political game given the productivities of the candidates' projects. Finally, I analyze the selection from potential candidates to candidates and the effects of changes in the underlying political institutions. I specify the available strategies, the payoffs these map into, and the definition of equilibrium of the respective stage along the way. I collect all proofs in Appendix A.

3.1 The Economy Given a Regime

The payoff of producers is determined by the payoff factor $\varphi(\theta, \tau)$ and the productivity of their project. Given a regime (θ, τ) enacted by the office holder, a producer w_i's payoff is

$$\varphi(\theta, \tau)w_i = (1 - \theta)(1 - \tau)w_i.$$

By taking over and executing the office holder's project, the idle individual becomes a producer, and aggregate output is 1. The resources that the appropriation sector acquires and distributes to its members are given by the quasiconcave function $\nu : [0, 1]^2 \to \mathbb{R}_+$, defined as

$$\nu(\theta, \tau) = \theta(1 - \tau).$$

Every appropriator receives a nonzero share of $\nu(\theta, \tau)$ so that the shares add up to one. The office holder's payoff is given by the strictly concave function $\tilde{w} : [0,1]^2 \to \mathbb{R}$, defined as

$$\tilde{w}(\theta, \tau) = \tau - g(1 - \theta).$$

The first part, τ, are all collected taxes; the second part, $g(1-\theta)$, is the cost of enforcing the secure fraction $(1-\theta)$ of after-tax income. Similar formulations can be found in, e.g., Polo (1999), Acemoglu (2005). I ignore the feasibility constraint $\tau \geq g(1-\theta)$, as it never binds.

3.2 Anarchy, Dictatorship, and Direct Democracy

By assumption, the anarchy regime is $(\theta^a, \tau^a) = (1, 0)$. That is, no taxes are raised, no enforcement is implemented, and property rights are perfectly insecure. In this case, producers have a payoff of zero, while appropriators obtain a positive payoff, as they are sharing all output amongst them. In fact, as producers implement their projects inelastically, anarchy maximizes aggregate consumption.

The political process may deliver a dictator whose problem is to maximize in-office payoff,

$$\text{(DP)} \qquad \max_{(\theta,\tau)\in[0,1]^2} \tilde{w}(\theta, \tau).$$

The solution is $(\theta^d, \tau^d) = (1, 1)$. The dictator taxes away all production and does not implement any enforcement whatsoever. The associated payoff is $\tilde{w}^d = \tilde{w}(\theta^d, \tau^d) = 1$. Producers and appropriators consume nothing. The dictator is rich, the population is poor.

If this society were a direct democracy, then the enacted regime would maximize the majority's payoff, subject to budget balance. If the majority are appropriators, then they choose anarchy. If the majority are producers, then they choose some taxation and enforcement. To the extent that appropriation represents redistribution from productive to unproductive agents, these predictions resemble results in Meltzer and Richard (1981).

3.3 The Political Game Given Two Candidates

In this section, I show that the candidate with the less productive project wins the election, but the enacted regime is dictated by the productivity of the loser's project. Thus, the set of alternatives voters face depends on and changes with the loser, which leads to different regimes and outcomes given the same fundamentals and office holder. I first specify strategies and payoffs and define the equilibrium of the subgame, which I then describe. Recall that the candidates and the regimes they propose are w_L, w_H, (θ_L, τ_L), and (θ_H, τ_H), where $w_L < w_H$.

3.3.1 Strategies, Payoffs, and Subgame Equilibrium Definition

Facing the set of proposals $\{(\theta_L, \tau_L), (\theta_H, \tau_H)\}$, every voter evaluates the associated payoffs. All $p-2$ noncandidate producers vote for regime (θ, τ) over the alternative regime (θ', τ') if

$$\varphi(\theta, \tau) > \varphi(\theta', \tau')$$

and, disregarding the preference shock, abstain if

$$\varphi(\theta, \tau) = \varphi(\theta', \tau').$$

Similarly, all a appropriators vote for regime (θ, τ) over the alternative regime (θ', τ') if

$$\nu(\theta, \tau) > \nu(\theta', \tau')$$

and, disregarding the preference shock, abstain if

$$\nu(\theta, \tau) = \nu(\theta', \tau').$$

Voters determine the map from the proposed regimes to payoffs, and the majority of them are producers. The actual political game is played between agents w_L and w_H when proposing regimes, taking into account the probabilities of winning the election determined by voting.

In specifying the probabilities of winning, it is convenient to let $\sigma = (\theta, \tau)$. Given the productivities of the candidates' projects w_i and w_{-i} and the proposals $\sigma_i = (\theta_i, \tau_i)$ and $\sigma_{-i} = (\theta_{-i}, \tau_{-i})$, let $P(\sigma_i, \sigma_{-i}; w_i, w_{-i}) = Prob\{w_i \text{ wins}|w_i, w_{-i}, \{(\theta_i, \tau_i), (\theta_{-i}, \tau_{-i})\}\}$ be the probability that candidate w_i, $i \in \{L, H\}$, wins the election. Disregarding the preference shock, the probability of the regime (θ, τ) winning is zero if $\varphi(\theta, \tau) < \varphi(\theta', \tau')$ or $\varphi(\theta, \tau) = \varphi(\theta', \tau')$ and $\theta(1-\tau) < \theta'(1-\tau')$, one half if and only if all voters are indifferent, and one if $\varphi(\theta, \tau) > \varphi(\theta', \tau')$ or $\varphi(\theta, \tau) = \varphi(\theta', \tau')$ and $\theta(1-\tau) > \theta'(1-\tau')$, respectively. One necessary condition for the preference shock to be effective is that the majority of voters, the producers, are indifferent between the regimes. If producers prefer one regime over the other, then they vote for it and it wins the election with certainty, irrespective of the preference shock. If producers are indifferent between the proposed regimes and for (only) one candidate, given the opponent's proposal, all platforms with positive probability of winning give a payoff in office that is lower than the payoff from losing, then that candidate is preferred by all producers if public-spiritedness happens to matter. That is, with probability $\varepsilon > 0$ all producers vote for this candidate, who then wins the election, even if appropriators vote for the opponent.

Candidate w_i, $i \in \{L, H\}$, faces the problem of proposing (θ_i, τ_i) to maximize the expected payoff, given (θ_{-i}, τ_{-i}) proposed by candidate w_{-i}, $-i \in \{L, H\} \backslash \{i\}$. The problem is

$$\text{(PP)} \qquad \max_{(\theta_i,\tau_i)\in[0,1]^2} \left\{ P(\sigma_i, \sigma_{-i}; w_i, w_{-i}) \tilde{w}(\theta_i, \tau_i) + (1 - P(\sigma_i, \sigma_{-i}; w_i, w_{-i})) \varphi(\theta_{-i}, \tau_{-i}) w_i \right\}.$$

The objective is the sum of the in-office payoff the proposal implies when winning, weighted by the probability of winning, and the out-of-office payoff under the opponent's proposal when losing, weighted by the probability of losing. An equilibrium of this stage is defined as follows.

Definition 1 (Equilibrium of the political game given two candidates)**.** *Given two candidates w_L and w_H, an equilibrium of the political game is a set of proposals $\{(\theta_L, \tau_L), (\theta_H, \tau_H)\}$ such that, for all $i \in \{L, H\}$, given (θ_{-i}, τ_{-i}), $-i \in \{L, H\} \backslash \{i\}$, (θ_i, τ_i) solves problem (PP).*

3.3.2 Equilibrium of the Political Game Given Two Candidates

The following proposition characterizes the equilibrium of the political game.

Proposition 1. *Given two candidates w_L and w_H, the political game has an equilibrium. In every equilibrium, candidate w_L wins the election with certainty, proposing the same regime, and proposing less enforcement than candidate w_H. The more productive the loser's project is, that is, the higher w_H, the worse is enforcement, the less secure are property rights, the lower are the producers' payoffs, and the higher is the office holder's payoff.*

The winning regime (θ_L, τ_L) is the single relevant object, and it is unique. While the majority of voters are producers, in equilibrium, the decisive voters in the election are the appropriators in the electorate. The reason is as follows. The payoff from production equals a payoff factor determined by the prevailing regime, multiplied by the productivity of the producer's project. In equilibrium, both regimes offer the same payoff factor to producers. Offering a strictly higher payoff factor than the other candidate wins the election with certainty. But it also invites a small increase in the tax rate to win the election with a strictly higher payoff in office. Therefore, producers must be indifferent and the regime that offers appropriators the higher payoff, through less enforcement, wins the election. That is, not only are appropriators the cause of the need for enforcement in the first place, they are also the decisive voters that determine the level of enforcement being implemented. To the extent that the chosen level of enforcement is low, those agents who live off appropriation activities are an obstacle to society choosing to implement more secure property rights.

The office holder can extract resources from the economy by setting high taxes and offering low enforcement expenditure. The loser to-be constrains the office holder to-be's discretion on such extraction through two channels. First, the loser to-be's proposal gives voters an alternative the winner to-be's proposal has to beat. Second, the winner to-be's regime proposal is constrained by the loser to-be's outside option. In equilibrium, the loser to-be has to weakly prefer losing the election and executing the project under the regime enacted by the winner to-be to getting into office with a regime proposal that at least ties the election. Therefore, the winner to-be cannot set "too high" taxes and divert "too much" of the receipts away from their use in enforcement. High taxes and weak enforcement give the winner to-be a high in-office payoff but offer the loser to-be a low payoff in production. Once this payoff from production is too low, relative to the winner to-be's in-office payoff, the loser to-be wants to get into office. In equilibrium, this constraint is binding and the winning regime solely depends on the productivity of the loser to-be's project, who thus determines (dictates) the equilibrium regime. It follows that two economies with the same technology, the same set of productive projects, and the same office holder may choose to implement different regimes. Different election losers to-be lead to different alternatives facing the respective voters, who then choose different outcomes.

Candidate w_L wins the election because candidate w_H has the better project and thus faces higher opportunity costs. In equilibrium, the winner to-be's in-office payoff cannot be greater than the loser to-be's payoff in production under the winner's regime. Otherwise, the loser to-be could profitably deviate to a regime proposal that stands a chance to win the office, with a higher payoff. Therefore, in any scenario in which candidate w_H wins the election, the associated in-office payoff is constrained by candidate w_L's outside option, whose project is less productive. That is, rather than holding office, w_H would prefer to execute the project under the regime put in place. Thus, in equilibrium, w_H loses the election and produces, while w_L holds office for a payoff that w_H would accept, too, i.e., $\tilde{w}(\theta_L, \tau_L) = \varphi(\theta_L, \tau_L) w_H$.

The fact that the productivity of the loser to-be's project determines the equilibrium regime has implications for variations in w_H. Given any regime, a candidate with a more productive project at hand requires a higher in-office payoff to be indifferent between holding office and executing the project. Facing an opponent that requires a high in-office payoff allows the candidate who eventually wins the election to also ask for a higher in-office payoff—setting high taxes and diverting a lot of resources, which lowers production payoffs—than in a case where the opponent requires a rather low payoff to hold office. In other words, a worse outside option for the loser to-be requires a lower in-office compensation to induce indifference. The winner to-be faces a tighter (binding) constraint, which restricts discretion more and leads to a favorable set of alternatives the electorate can choose from. Therefore, the less productive the loser to-be's project is, the lower w_H, the better is the enforcement implemented and the more secure are property rights. This result suggests that societies whose leaders and runners-up (or, more generally, politicians) do not have too high out-of-office earning potentials (before any effects of having served in office), relative to the population, should do better than societies whose political leaders have extremely high relative earning potentials. It does not say that we should expect to see uneducated or unskilled political leaders.[11] In addition, ignoring economic fundamentals, one might expect only small differences among established democratic societies but larger differences between those and autocratic or oligarchic societies. In the latter, the earning potential of the political elites and their associates is likely relatively higher, compared to the rest of the population, than in the former. Finally, the office holder's payoff increases with the loser's productivity. That is, in societies with weak enforcement and insecure property rights in equilibrium, office holders capture high payoffs. This implication is consistent with anecdotal evidence that autocrats tend to accumulate relatively more wealth while in office than leaders in established democratic societies (see, e.g., Acemoglu et al. (2004)).

The majority rule equilibrium here is induced by the institutional structure of the political process, a possibility pointed out by Plott (1967) and emphasized by Shepsle and Weingast (1981). While the candidates have no incentive to deviate, there exist regimes in the policy space that would command a majority over the winning proposal. Any regime that increases the payoff of producers would win the election. In fact, being a producer, the loser would prefer such a regime. However, proposing it would guarantee an in-office payoff that is strictly less than the payoff the loser gets from production under the currently winning regime. No agent that is not a candidate can propose it. The winner to-be has no incentive to propose it and, in fact, would like to extract more resources. Trying to do so, however, means to lose the election and being left with a payoff from production that is strictly less than the in-office payoff associated with the initially winning proposal. Thus, nobody can profitably deviate.

Given the outcome of the political game between any two candidates, I can analyze the selection of potential candidates into electoral competition.

3.4 The Selection Game Given a Set of Potential Candidates

At this stage, all potential candidates want agents with rather unproductive projects to run because election losers with worse outside options imply preferred outcomes. Thus, in equilibrium, the two potential candidates with the least productive projects run for office. I first specify strategies and payoffs and define the equilibrium of the subgame to then analyze it.

3.4.1 Strategies, Payoffs, and Subgame Equilibrium Definition

Consider the set $N = \{w_1^N, \ldots, w_n^N\}$ of potential candidates, with their indices collected in $J = \{1, \ldots, n\}$. For any $j \in J$, let $N_j = N \backslash \{w_j^N\}$ be the set of all agents in N, except w_j^N. Each agent $w_j^N \in N$ chooses $\chi_j \in \{0, 1\}$, where $\chi_j = 1$ indicates running (if drawn when more than two want to run), while $\chi_j = 0$ indicates not running. A strategy profile for N is

[11] See Caselli and Morelli (2004) on the selection of "bad politicians" for positions in public offices.

given by $\{\chi_j\}_{j\in J}$, a profile for N_k is given by $\{\chi_j\}_{j\in J\setminus\{k\}}$. Any such strategy profiles can be summarized by the sets $N' = \{w_j^N \in N : \chi_j = 1\}$ and $N'_k = \{w_j^N \in N_k : \chi_j = 1\}$, collecting the agents that want to run. Let $n'_k = |N'_k|$.

Fixing $j \in J$, for all $w' \in N'_j$, define $x_j(w') = |\{w \in N'_j : w < w'\}|$ to be the number of agents w in N'_j that would win the election against w' if the pair $\{w, w'\}$ were selected to run for office. Abusing notation slightly, let $(\theta(w'), \tau(w'))$ denote the regime when w' loses and determines the outcome. Then, $x_j(w')$ is the number of pairs $\{w, w'\} \subseteq N'_j$, with $(\theta(w'), \tau(w'))$ as the equilibrium outcome of the political game. The probability of any particular pair of agents in a set with $\hat{n}$ members to be selected to compete for office is given by $\pi(\hat{n}) = 2/[\hat{n}(\hat{n}-1)]$. Then, given the strategy profile N'_j, agent w_j^N's expected payoff of not running is

$$(1) \qquad V_0(n'_j) = \begin{cases} 0 & \text{if } n'_j \le 1, \\ \sum\limits_{w' \in N'_j} \pi(n'_j) x_j(w') \varphi(\theta(w'), \tau(w')) w_j^N & \text{if } n'_j > 1. \end{cases}$$

The expected payoff of not running is zero if $n'_j \le 1$, because not running implies either anarchy if $n'_j = 0$, or a dictatorship if $n'_j = 1$. The expected payoff of not running when $n'_j > 1$ is a weighted average of the payoffs implied by all possible regimes, where the weights are the probabilities of those regimes arising as the outcome of the election. The payoff associated with the regime $(\theta(w'), \tau(w'))$ is $\varphi(\theta(w'), \tau(w'))w_j^N$; the probability of the regime $(\theta(w'), \tau(w'))$ to be implemented as the outcome of the political game is $\pi(n'_j)x_j(w')$.[12]

Similarly, given the strategy profile N'_j, agent w_j^N's expected payoff of running is

$$(2) \qquad V_1(n'_j) = \begin{cases} \tilde{w}^d & \text{if } n'_j = 0, \\ \pi(n'_j + 1)\Bigg[\sum\limits_{w' \in N'_j} x_j(w')\varphi(\theta(w'), \tau(w'))w_j^N & \\ \quad + \sum\limits_{\substack{w_j^N < w' \\ w' \in N'_j}} \varphi(\theta(w'), \tau(w'))w' + \sum\limits_{\substack{w_j^N > w' \\ w' \in N'_j}} \varphi(\theta(w_j^N), \tau(w_j^N))w_j^N\Bigg] & \text{if } n'_j > 0. \end{cases}$$

The payoff of running is the dictator payoff $\tilde{w}^d$ if $n'_j = 0$, because in that case running makes w_j^N a dictator. If at least one other agent is running, i.e., $n'_j > 0$, then the expected payoff of running weights the payoffs from all possible regimes by the probability of those regimes being implemented as the outcome of the political game. If w_j^N chooses to run,

[12] As $x_j(w')$ cannot exceed $n'_j - 1$, while $n'_j \ge 2$ in this case, $\pi(n'_j)x_j(w') \le 1$. As $\sum_{w' \in N'_j} x_j(w')$ sums the integers from 0 to $n'_j - 1$, $\sum_{w' \in N'_j} \pi(n'_j)x_j(w') = \frac{2}{n'_j(n'_j-1)} \sum_{w' \in N'_j} x_j(w') = 1$.

then every pair of candidates arises with probability $\pi(n'_j+1) = 2/[(n'_j+1)n'_j]$.[13] Thus, if $n'_j > 1$, then all outcomes that can arise when w_j^N chooses not to run can still arise when w_j^N is not selected to run, but each one has a lower probability to realize. In the case that w_j^N is selected to run against $w' \in N'_j$ in the election, w_j^N wins if $w_j^N < w'$, getting a payoff $\tilde{w}(\theta(w'), \tau(w')) = \varphi(\theta(w'), \tau(w'))w'$, and loses if $w_j^N > w'$, getting a payoff $\varphi(\theta(w_j^N), \tau(w_j^N))w_j^N$.

Combining (1) and (2), given the strategy profile N'_j, agent $w_j^N \in N$ faces the problem

$$\text{(SP)} \qquad \max_{\chi_j \in \{0,1\}} (1-\chi_j)V_0(n'_j) + \chi_j V_1(n'_j).$$

An equilibrium of the selection game is defined as follows.

Definition 2 (Equilibrium of the selection game given a set of potential candidates)**.** *Given a set N of potential candidates, an equilibrium of the selection game is a set N', or, equivalently, a strategy profile $\{\chi_j\}_{j\in J}$, such that, for all $w_j^N \in N$, given N'_j, χ_j solves (SP).*

3.4.2 Equilibrium of the Selection Game Given a Set of Potential Candidates

The following result characterizes the equilibrium outcome of the selection game.

Proposition 2. *Given a set N of potential candidates, the selection game has a unique equilibrium $N' = N$ if $|N| \leq 2$ and $N' = \{w_1^N, w_2^N\}$ otherwise.*

Every potential candidate strictly prefers running to enduring anarchy or a dictatorship. What is more, due to the strategic interaction in the political game, agents with unproductive projects can increase their otherwise low payoff by running for office. By choosing to run, potential candidate w_1^N has a positive probability of competing for office. If competing, w_1^N wins with certainty and receives an in-office payoff equal to the production payoff of the more productive loser of the election. Independent of who the loser is, w_1^N is always better off winning against that loser in electoral competition for the associated payoff than not running and executing the project under the same regime implemented as an outcome of the political game between the loser and another agent. Thus, w_1^N runs. Given that w_1^N runs, w_2^N also prefers running since it gives a positive probability of w_2^N competing for office. (In fact, running is dominant for w_2^N irrespective of w_1^N's decision.) When competing for office against w_1^N, w_2^N loses with certainty and receives the highest possible payoff as w_2^N has the least productive project an election loser can have. (Recall that the less productive a project the loser has available, the better is the outcome.) Competing against anybody else, w_2^N wins

[13]As $\sum_{w' \in N'_j}(x_j(w')+1)$ sums the integers from 1 to n'_j, $\sum_{w' \in N'_j} \pi(n'_j+1)x_j(w') + \sum_{w' \in N'_j} \pi(n'_j+1) = \frac{2}{n'_j(n'_j+1)} \sum_{w' \in N'_j}(x_j(w')+1) = 1$.

and receives an in-office payoff equal to the more productive loser's production payoff under the resulting regime. Irrespective of who the loser is in that case, w_2^N is always better off in office than executing the project under the same regime. Given that w_1^N and w_2^N run, all other agents prefer to refrain from running so as to guarantee that w_2^N competes with w_1^N, thereby maximizing the expected payoff of all other potential candidates. The equilibrium is unique and w_1^N wins the election, while w_2^N determines the outcome.

3.5 Political Institutions

A full equilibrium with a unique outcome exists because it does at each stage. In this section, I focus on political institutions that determine certain elite groups within society. I refer to the political elite as those agents who can engage in activities in the political arena, such as running for office, and to the qualified electorate as those agents who are entitled to vote. This way, I distinguish between those who can vote and those who can participate in the process that determines the alternatives voters can choose from. At the same time, both the political elite and the qualified electorate represent concepts of elite. An important aspect of elites is that its members are "well-connected," which is likely to result in higher returns to market activity.[14] I therefore assume that the political elite consists entirely of producers, and the majority of voters in any restricted qualified electorate are producers as well. I show that, in this model, more political competition, even within a narrow elite that can vote, leads to better outcomes, but allowing more people to vote, without more competition, does not.

3.5.1 The Political Elite

I stylize the selection of individuals that are presented with an opportunity to actively engage in the political arena by assuming that the political elite is identical with the economic elite. That is, only the producers with the most productive projects may choose to run for office.[15] While this restriction may represent formal property and educational qualifications, it does not need to be formal. The productivity of an agent's project may well be a function of how well connected that agent is with and within elite groups. It may arise from networks and status established by inheritance or (previous) economic success. The political institutions then determine whose projects are productive enough to enjoy the privilege of access to the political arena. The number n of potential candidates identifies this institution in the model. For any $n \leq p$, the agents $w_{p+1-n}, \ldots, w_p$ constitute the set N of potential candidates. Therefore, the number n is a metric of political competition in the sense of how broad the political elite is. It can be a very small number of five agents at the top of the income

[14] See, e.g., North et al. (2007) on elites and limited access to both political and economic activities.

[15] A similar approach to elites in the context of the extension of voting rights can be found in, e.g., Gradstein (2007). In the same context, the (all identical) rich form an elite in, e.g., Acemoglu and Robinson (2000, 2001).

distribution in society or a very large number of five million. Proposition 3 obtains.

Proposition 3. *A broader political elite, a larger n, implies more secure property rights.*

This result derives from the insight that the equilibrium outcome depends only on the productivity of the project of agent w_2^N. Easier access to the political arena for more agents implies better outcomes. More generally, being a member of the political and economic elite might only offer a positive probability of becoming a potential candidate, while non-members have no chance of getting an opportunity to be active in the political arena. Then, political fundamentals that make losers with unproductive projects more likely favor better outcomes. An example is drawing more potential candidates with less restrictive productivity requirements. Everything that increases the probability of the productivity of project w_2^N being low improves the likelihood of good outcomes. Or, easier access to the political arena does not imply better outcomes but makes them more likely.

The interpretation is that better outcomes with more secure property rights are more likely when running for office is less restricted. It suggests that societies should lift restrictions on who can be politically active, be it by removing requirements like land ownership or by revolting against a narrow political elite. In politically more open societies, the winner to-be is more likely to face opponents with unattractive outside options who impose tighter constraints on office holder discretion and thus dictate better outcomes. Societies that recruit executives from narrow groups of, relative to the population, well educated high-income individuals instead are likely to see weak property rights and high rents from holding office.

To the extent that project productivities may reflect educational outcomes and democracies allow easier access to activities in the political arena, at first sight, Proposition 3 seems to suggest that more democratic societies select less educated office holders. Such a prediction contradicts the findings in Besley and Reynal-Querol (2011) and Besley et al. (2011): democracies are more likely to select highly educated leaders than autocracies, and it matters for growth. However, in the model here, the productivity of a project represents the value of a candidate's outside option. It may well be more connected to an agent's elite status—connections and past economic success or inherited status—than it is related to education. Due to its static nature, the model cannot speak to implications for growth.

For the same reason, the model does not speak to endogenous change of the political institutions. Nonetheless, one may wonder whether a narrow political elite would oppose relaxing the restrictions on political activities. After all, its members are producers whose payoffs would increase if restrictions were relaxed. However, the payoffs of both candidates in the election increase with the productivity of the loser to-be's project. In addition, with broader access to political activities, the winner to-be stands to lose the rent accruing to the comparative advantage in office. Without more structure and further information about the composition of the political elite (or a more realistic model of it) it is not clear which effect dominates. A hypothetical incumbent may thus not want to propose such a relaxation. If nobody else can propose it (e.g., in the sense of Plott (1967) and Shepsle and Weingast (1981)), restrictions on political activities may persist.

Finally, notice that, while members of the political elite face the same payoff factor as non-members, they do realize the highest payoffs in society (by assumption).

3.5.2 The Qualified Electorate

The other dimension of political institutions determines the qualified electorate, that is, who can vote over the proposed regimes. By assumption, the majority of voters in the population are producers. I assume that this is the case in any qualified electorate, also in those that are restricted so that not everybody can vote. Therefore, qualified electorates do not deliver anarchy as the election outcome. (See Section 4 for a discussion.) In addition, the political game has an equilibrium only if the qualified electorate is admissible in the following sense.

Definition 3. *A qualified electorate is admissible if it contains at least one appropriator.*

If the qualified electorate consisted of producers only, then any winning regime in the political game that offers producers a strictly higher payoff than the alternative invites a profitable deviation to a slightly higher tax rate. However, both candidates proposing regimes that offer the same payoff to producers, giving positive probability of winning to both, allows profitable deviations because one candidate has a better outside option than the other. Thus, with a producers-only electorate, an equilibrium of the political game does not exist. If income and wealth are imperfectly correlated, family ties matter, or being in the elite offers opportunities for appropriation, such as corruption, then an elite with respect to voting rights may well contain unproductive agents that engage in appropriation. The following result obtains.

Proposition 4. *All admissible qualified electorates result in the same equilibrium outcome.*

This result derives from two features of the model. First, while the majority of voters are producers, in equilibrium, the decisive voters in any admissible electorate are appropriators. Second, changing the electorate that determines the voting outcome does not affect the payoffs associated with the proposed regimes, which are determined by the set of productive projects. Given two regime proposals, the decisive voters in all admissible qualified electorates, appropriators, prefer the same one. Hence, the voting outcomes are the same, and thus the proposals are the same, unless the candidates differ. It follows that the equilibrium outcomes are the same, even if more people are allowed to vote, unless more people are allowed to run for office, too. The equilibrium outcome does change, of course, if an initial extension of voting rights changes the occupation of the majority of the voters. As I discuss in Section 4, if the majority of voters are appropriators, then the equilibrium outcome is either anarchy or a dictatorship (see Proposition 5).

Although unfit to study endogenous change of political institutions, the model's predictions suggest a possible explanation for a persistent lack of secure property rights during times of voting rights extension. One explanation suggested by Acemoglu and Robinson (2006, 2008) distinguishes between de facto and de jure political power. Here, the de facto power of deciding the outcome is always with the voting body—however narrow or wide it may be.

Finally, I ignore many potentially important economic mechanisms. For example, in the model here, a universal right to vote plays no role in preventing a majority from taking advantage of a minority, which would provide one justification for it (see Gersbach (2004)).

4 Discussion

In this section, I briefly discuss some of my modeling choices that simplify the analysis.

Risk Neutrality. I assume risk neutral agents. As the model is, curvature has no effect.

No Deadweight Loss from Appropriation. The results remain unchanged if the process of appropriation and redistribution of the acquired resources is subject to some deadweight loss occurring due to destruction or damage. This loss could be captured by an increasing function $v : \mathbb{R}_+ \to \mathbb{R}_+$ that maps the appropriated resources into a weakly smaller but strictly positive quantity of resources available for distribution among appropriators. As long as each appropriator still receives some fixed nonzero share of the remaining resources, adding this assumption does not affect the results.

(Fixed) Groups of Agents. The underlying economy can be thought of as a reduced form version of one in which agents have the choice to take up an occupation in production or appropriation, similar to Murphy et al. (1993) and Acemoglu (1995). All results here hold as long as, under all conceivable regimes, at least one agent appropriates, but never quite half of the population. While I assume that $p - 2 > a$, the exact numbers and proportions do not matter for the equilibrium outcome. Allowing for $a > 1$ lends generality to the discussion of franchise extensions as individuals from either group as well as from both groups can be added. For completeness, I report here that the political process delivers either anarchy or a dictatorship if the majority of voters are appropriators, which is the case when $p - 2 < a$.

Proposition 5. *If $p - 2 < a$, then the equilibrium outcome is either anarchy or a dictatorship.*

In the proof it becomes clear that an election delivers anarchy if the majority of voters are appropriators, as one would expect from the discussion of the anarchy regime in Section 3.2.

Economic Activity. I assume that producers implement their projects inelastically. While this assumption precludes effects of the regime choice on production decisions and thus aggregate output, removing it does not affect the outcome of the political game. However, more structure on the underlying economy is required to describe the effects of variations in w_H. A set of sufficient conditions could restrict the environment so that the elasticities with respect to the security of property rights of both an implicit function that arises in the analysis and economic activity are small enough. As the focus is on political institutions, I opted for simplicity.

Office Holders Hold Office Full-Time. I maintain the assumption that societies' top executives hold office full-time and cannot execute their project. In many cases where the precedent is that presidents divest from businesses to reduce the potential for a conflict of interest, this assumption seems to be a reasonable simplification. With regards to more oligarchic and even kleptocratic states that hold elections, any business the top executives might operate may well benefit from or outright build on the executives' very position at the top of the state. The endogenous rents from holding office in the model capture some of these aspects.

To relax the assumption that the office is held full-time, suppose that an office holder can execute a fraction $(1-\gamma) < 1$ of their project, and the idle individual takes over and executes the remaining fraction $\gamma > 0$ of it. The proceeds accruing to the office holder from the project are subject to both taxation and appropriation. Proposition 6 obtains.

Proposition 6. *If $\tilde{w}(\theta, \tau) + \varphi(\theta, \tau)(1-\gamma)w$ is quasiconcave in (θ, τ) for all $w \in \mathcal{W}$, then Propositions 1–4 hold without further qualification.*

This result builds on the fact that as before, all else equal, agents with more productive projects face higher opportunity costs of holding office as long as they have to give up at least some fraction of their project to do so. The assumption in Proposition 6 is sufficient; a sufficient condition for it to be satisfied that involves only the cost function g is that $2g'(1-\theta) + g''(1-\theta)\theta \geq 2$ for all $(1-\theta) \in (0, 1)$. An example of such a cost function is $g(1-\theta) = (1-\theta)^2$. Of course, the restrictions on g can be less restrictive, if one is willing to also restrict other fundamentals, such as γ and $\mathcal{W}$.

The Idle Individual. The role of the idle individual is technical in nature as it lends tractability without having to impose more structure. By taking over and executing the office holder's project, the idle individual makes sure that, all else equal, aggregate output is independent of the office holder's identity. Due to the finite number of agents, if the office holder's project is not executed, then office holders with different projects imply different aggregate output, irrespective of the policies they put in place. With the appropriate alternative assumption that there is no idle individual that executes the office holder's project, all qualitative results pertaining to the equilibrium of the political game are unaffected. However, the equilibrium regime would also depend on the productivity of the project of candidate w_L, the office holder to-be. Similar to the dependence on w_H, a more productive project w_L lowers the enforcement enacted. Yet, without additional assumptions, the overall effect of a more productive project w_L on the producer payoff factor is ambiguous as the tax rate decreases, too. Assuming that an idle individual takes over and executes the office holder's project works around this complication without having to impose more structure. The assumption that the idle individual does not participate in the political process is made for convenience, but is otherwise immaterial.

As to the economic interpretation of this assumption, the idle individual can be thought of as making a take-it-or-leave-it offer to acquire and execute the election winner's project. Being unable to execute it while in office, the project has no value to the election winner. Therefore, the idle individual can acquire it at no cost. An alternative interpretation is that no project is revolutionary enough to ensure that, even with time, no other individual can come up with a close enough substitute that can, e.g., compete for the same market. Then, the idle individual can be thought of as someone who, while the election winner transitions into office, develops a project that captures the market the office holder's project would have appealed to.

Productivity-independent Enforcement Technology. I assume that the enforcement technology is independent of an agent's productivity. That is, all agents are equally "productive" in office, while their productivity varies in production. However, as interpreted in the model, the productivity is not associated with a producer but with a project, which is potentially transferable. If interpreted differently, an enforcement technology that is very sensitive to a candidate's productivity can overturn the unproductive candidate's comparative advantage in office. Despite that, considering a productivity-independent enforcement technology is of interest because (i) an advantage for skilled businesspersons is not obvious, even if the political dimension was related to doing business per se, and (ii) a productivity-dependent enforcement technology blurs the implications of the strategic interaction.

Two Candidates. Intuitively, the results should carry over to the case in which more than two candidates can actually run for office: the winner to-be would have to observe all other candidates' outside options, and the tightest and binding constraint is the outside option of the opponent with the least productive project. However, the assumption that only two candidates can run for office simplifies both the analysis and the exposition by fixing the number of players in the political game to two. Without it, the number of players in the political game can be anything from two to n, which considerably complicates the characterization of equilibrium. Ignoring the strategic interaction in the political game, see, e.g., Osborne and

Slivinski (1996) for more details.

Preference Shock. Without the preference shock, the model would exhibit multiple equilibria in the political game. These equilibria are qualitatively identical in the sense that producers are indifferent between the proposed regimes and the same candidate wins by proposing less enforcement. The preference shock selects equilibria so that I can characterize them. It does not affect the qualitative characteristics of equilibrium or the mechanism at work. The shock's interpretation is that voters may value public-spiritedness. In this case, they prefer candidates that run for office despite the highest possible payoff from winning being strictly less than the payoff from losing promised by the other candidate's proposal.

5 Conclusion

I study how a strategic interaction in a political game shapes a society's choice of a property rights enforcement regime by determining the induced choice set facing it. The model offers explanations for cross-country differences in the security of property rights that correlate with measures of political competition. It does so without resorting to economic fundamentals but by tracing those differences back to certain political institutions. One implication is that two societies may implement very different regimes—as implied by election losers with different productivity—while they initially appear to be very similar in many supposedly relevant dimensions, such as economic fundamentals and office holders, as characterized by their productive projects. Another implication is that easier access to activities in the political arena for more people leads to better outcomes, while, once elections are held, allowing more people to vote without allowing more people to run for office does not. The model does not capture the trade-off between diverting resources today and inducing investments into a larger pie to divert resources from tomorrow. Future work could embed a similar political process into a dynamic model with a role for the expected future security of property rights; and it could endogenize economic activity, potentially with a role in determining project productivities. In such a setting, different political institutions in the sense of this paper may generate divergent paths of economic development.

A Appendix

Proposition 1

Proof. The proof proceeds in a number of steps. I describe what an equilibrium has to look like, find all candidate equilibria (all of which have the same unique winning regime), and show that they in fact are equilibria. Recall that the majority of voters are producers and notice that the preference shock therefore can have bite only if producers are indifferent.

1. *In equilibrium, the proposed regimes (θ, τ) and (θ', τ') satisfy $\varphi(\theta, \tau) = \varphi(\theta', \tau') > 0$.* Suppose for a contradiction that $\varphi(\theta, \tau) \neq \varphi(\theta', \tau')$. Without loss of generality assume that w proposes the regime (θ, τ) such that $\varphi(\theta, \tau) > \varphi(\theta', \tau')$, which means that w wins the election with certainty. Note that $\varphi(\theta, \tau) > \varphi(\theta', \tau') \geq 0$ implies that $(1 - \theta) > 0$ and $(1 - \tau) > 0$. Then, w can deviate to proposing $(\theta'', \tau'') = (\theta, \tau + \epsilon)$ for a small enough $\epsilon > 0$ and reduce $(1 - \tau)$ slightly so that, by continuity, $\varphi(\theta'', \tau'') > \varphi(\theta', \tau')$ and w still wins, with a higher payoff, a contradiction. Thus, $\varphi(\theta, \tau) = \varphi(\theta', \tau')$. Now, suppose for a contradiction that $\varphi(\theta, \tau) = \varphi(\theta', \tau') = 0$. At least one of the candidates has a positive probability of losing and thus getting a payoff of 0. By continuity, that candidate can profitably deviate to proposing $(\theta'', \tau'') = (1 - \epsilon, 1 - \epsilon)$ for a small enough $\epsilon > 0$ to win the election with certainty, as $\varphi(\theta'', \tau'') > 0$, and enjoy a higher expected payoff because $\tilde{w}(\theta'', \tau'')$ can be made arbitrarily close to the dictator payoff, a contradiction.

2. *In equilibrium, if w_o proposes (θ, τ) and wins the election with positive probability over the opponent's regime proposal (θ', τ'), then $\tilde{w}(\theta, \tau) \geq \varphi(\theta', \tau')w_o$.* Suppose for a contradiction that $\varphi(\theta', \tau')w_o > \tilde{w}(\theta, \tau)$. Then, w_o can profitably deviate to proposing $(\theta'', \tau'') = (\theta, 1)$, which loses the election with certainty, as $\varphi(\theta', \tau') > 0 = \varphi(\theta'', \tau'')$, thereby giving w_o a higher expected payoff, a contradiction.

3. *In equilibrium, if w_o proposes (θ, τ) and wins the election with positive probability over the opponent's regime proposal (θ', τ'), then $\tilde{w}(\theta, \tau) \geq \tilde{w}(\theta', \tau')$.* Suppose for a contradiction that $\tilde{w}(\theta', \tau') > \tilde{w}(\theta, \tau) \geq \varphi(\theta', \tau')w_o > 0$, where the last two inequalities derive from steps **2** and **1**. Then, by continuity, w_o can profitably deviate to proposing the regime $(\theta'', \tau'') = (\theta', \tau' - \epsilon)$ for a small enough $\epsilon > 0$, such that $\tilde{w}(\theta'', \tau'') > \tilde{w}(\theta, \tau) \geq \varphi(\theta', \tau')w_o$, to win the election with certainty, as it offers all voters a strictly higher payoff than (θ', τ'), and enjoy a higher expected payoff, a contradiction.

4. *In equilibrium, if w_{-o} proposes (θ', τ') and loses with positive probability against the opponent's regime proposal (θ, τ), then $\varphi(\theta, \tau)w_{-o} \geq \tilde{w}(\theta, \tau)$.* Suppose for a contradiction that $\tilde{w}(\theta, \tau) > \varphi(\theta, \tau)w_{-o} > 0$. Note that $\tilde{w}(\theta, \tau) \geq \tilde{w}(\theta', \tau')$ by step **3** as (θ, τ) wins with positive probability. Then, by continuity, w_{-o} can profitably deviate to proposing $(\theta'', \tau'') = (\theta, \tau - \epsilon)$ for a small enough $\epsilon > 0$, win the election with certainty, as (θ'', τ'') offers all voters a strictly higher payoff than (θ, τ), and enjoy a higher expected payoff than before, a contradiction.

5. *In equilibrium,* $(\theta_L,\tau_L) \neq (\theta_H,\tau_H)$. Suppose for a contradiction that $(\theta_L,\tau_L) = (\theta_H,\tau_H) = (\theta,\tau)$. Then, each candidate wins with positive probability. Thus, from **4** and **2** it must hold that $\varphi(\theta,\tau)w_L \geq \tilde{w}(\theta,\tau) \geq \varphi(\theta,\tau)w_H > \varphi(\theta,\tau)w_L$, a contradiction.

6. *Candidate w_L wins with certainty.* Suppose for a contradiction that w_H wins the election with positive probability. Then, since $\varphi(\theta_L,\tau_L) = \varphi(\theta_H,\tau_H)$ it must hold that $\tilde{w}(\theta_H,\tau_H) \geq \varphi(\theta_L,\tau_L)w_H = \varphi(\theta_H,\tau_H)w_H > \varphi(\theta_H,\tau_H)w_L \geq \tilde{w}(\theta_H,\tau_H)$, a contradiction.

7. *In equilibrium, the regime (θ_L,τ_L) that wins the election with certainty solves*

$$\max_{(\theta,\tau)\in[0,1]^2} \tilde{w}(\theta,\tau) \quad s.t. \quad \varphi(\theta,\tau) \geq \bar{\varphi} \equiv \varphi(\theta_H,\tau_H). \tag{P}$$

Suppose not. Suppose for a contradiction that (θ_L,τ_L) wins the election with certainty and violates the constraint so that $\varphi(\theta_L,\tau_L) < \varphi(\theta_H,\tau_H)$. Then, (θ_H,τ_H) wins the election with certainty, a contradiction. Suppose for a contradiction that (θ_L,τ_L) wins the election with certainty but does not solve (P). Then, there is a (θ',τ') such that $\tilde{w}(\theta',\tau') > \tilde{w}(\theta_L,\tau_L)$ and $\varphi(\theta',\tau') \geq \bar{\varphi}$. Then, by continuity, w_L could deviate to proposing $(\theta'',\tau'') = (\theta',\tau'-\epsilon)$ for a small enough $\epsilon > 0$ so that $\tilde{w}(\theta',\tau'-\epsilon) > \tilde{w}(\theta_L,\tau_L)$ and $\varphi(\theta',\tau'-\epsilon) > \varphi(\theta',\tau') \geq \bar{\varphi} = \varphi(\theta_H,\tau_H)$ to win the election with certainty and enjoy a higher payoff, a contradiction. Therefore, solving Problem (P) (note that $\theta < 1$ and $\tau < 1$), (θ_L,τ_L) and (θ_H,τ_H) satisfy

$$g'(1-\theta_L)(1-\theta_L) = (1-\tau_L), \tag{3}$$

$$\varphi(\theta_H,\tau_H) = \varphi(\theta_L,\tau_L). \tag{4}$$

8. *In equilibrium,* $\varphi(\theta_L,\tau_L)w_H = \tilde{w}(\theta_L,\tau_L)$. As w_L wins, from steps **4** and **2**, $\varphi(\theta_L,\tau_L)w_H \geq \tilde{w}(\theta_L,\tau_L) \geq \varphi(\theta_H,\tau_H)w_L$. Suppose for a contradiction that $\varphi(\theta_L,\tau_L)w_H > \tilde{w}(\theta_L,\tau_L)$. As (θ_L,τ_L) solves Problem (P) and $\varphi(\theta_L,\tau_L) = \varphi(\theta_H,\tau_H)$, the highest in-office payoff a regime (θ',τ') with positive probability of winning can promise w_H is $\tilde{w}(\theta_L,\tau_L)$, which is less than w_H's payoff from losing. Thus, producers, who are the majority, are indifferent between the proposed regimes and candidate w_H runs for office despite, given w_L's proposal, all winning platforms give a payoff in office that is lower than the payoff from losing. The same is not true for w_L. Therefore, due to the preference shock, with probability $\varepsilon > 0$, the majority of voters vote for w_H, who thus wins the election with positive probability, a contradiction. Therefore,

$$\varphi(\theta_L,\tau_L)w_H = \tilde{w}(\theta_L,\tau_L) = \tau_L - g(1-\theta_L). \tag{5}$$

9. *In equilibrium,* $\nu(\theta_L,\tau_L) > \nu(\theta_H,\tau_H)$ *so that* $\theta_H < \theta_L$. Suppose for a contradiction that $\nu(\theta_L,\tau_L) \leq \nu(\theta_H,\tau_H)$. As $\varphi(\theta_L,\tau_L) = \varphi(\theta_H,\tau_H)$, w_H wins with positive probability, a contradiction. Thus, $\nu(\theta_L,\tau_L) > \nu(\theta_H,\tau_H)$, that is, $\theta_L(1-\tau_L) > \theta_H(1-\tau_H)$, which with

$\varphi(\theta_L, \tau_L) = \varphi(\theta_H, \tau_H)$ implies $(1 - \tau_L) > (1 - \tau_H)$. Thus, $(1 - \theta_L) < (1 - \theta_H)$ or

$$\theta_H < \theta_L. \tag{6}$$

10. Collecting equations (3)–(6) gives

$$\varphi(\theta_L, \tau_L) w_H = \tau_L - g(1 - \theta_L), \tag{7}$$

$$g'(1 - \theta_L)(1 - \theta_L) = (1 - \tau_L), \tag{8}$$

$$\varphi(\theta_H, \tau_H) = \varphi(\theta_L, \tau_L) \text{ and } \theta_H < \theta_L. \tag{9}$$

Now, (7) and (8) are two equations in two unknowns that can be solved for (θ_L, τ_L), and the solution has to be interior. Then, any regime (θ_H, τ_H) that satisfies (9) makes for an equilibrium. Therefore, consider equations (7) and (8). From (8),

$$(1 - \tau_L) = g'(1 - \theta_L)(1 - \theta_L) \quad \text{and thus} \quad \tau_L = 1 - g'(1 - \theta_L)(1 - \theta_L). \tag{10}$$

Plugging these into (7) using $\varphi(\theta_L, \tau_L) = (1 - \theta_L)(1 - \tau_L)$ and rewriting gives

$$g'(1 - \theta_L)(1 - \theta_L)\left((1 - \theta_L) w_H + 1\right) = 1 - g(1 - \theta_L).$$

Let $h : (0, 1) \times \mathbb{R}_+ \to \mathbb{R}$ be given by

$$h((1 - \theta); w_H) = g'(1 - \theta)(1 - \theta)\left((1 - \theta) w_H + 1\right) + g(1 - \theta) - 1.$$

This function h is strictly increasing in both its arguments and, fixing w_H, approaches negative and positive values when $(1 - \theta)$ approaches zero and one, respectively. Thus, for any $w_H \in \mathbb{R}_+$ (or in $\mathcal{W}$), there exists a unique $(1 - \theta_L)$ such that $h((1 - \theta_L); w_H) = 0$ and that $(1 - \theta_L)$ is strictly smaller the higher w_H is. The unique $(1 - \theta_L)$ implies a unique $(1 - \tau_L)$ via (10). Moreover, $(1 - \tau_L)$ is strictly increasing in $(1 - \theta_L)$. So, a higher w_H strictly decreases both $(1 - \theta_L)$ and $(1 - \tau_L)$ and thus $\varphi(\theta_L, \tau_L)$ and strictly increases the in-office payoff.

11. *Finally, neither candidate can profitably deviate.* By construction, given (θ_H, τ_H), w_L cannot increase expected payoffs by deviating. No other proposal that wins with positive probability gives a higher in-office payoff. Deviating to proposing a regime that loses the election, w_L would earn a strictly smaller payoff, because $\tilde{w}(\theta_L, \tau_L) = \varphi(\theta_L, \tau_L) w_H = \varphi(\theta_H, \tau_H) w_H > \varphi(\theta_H, \tau_H) w_L$. Similarly, given (θ_L, τ_L), w_H cannot increase expected payoffs by deviating. Any deviation that still loses the election does not change payoffs and the maximal in-office payoff of a proposal (θ', τ') that gives w_H a positive probability of winning, and thus observes $\varphi(\theta', \tau') \geq \varphi(\theta_L, \tau_L) = \varphi(\theta_H, \tau_H)$, is $\tilde{w}(\theta_L, \tau_L) = \varphi(\theta_L, \tau_L) w_H$. Thus, the set of proposals described is an equilibrium. ∎

Proposition 2

Proof. I find the unique pure strategy equilibrium by iterated elimination of strictly dominated strategies. Consider any agent $w_j^N \in N$ and let $n_j' \leq 1$. Not running implies either anarchy or some other agent's dictatorship, and each yields a payoff of zero. Running yields a strictly positive payoff either as the dictator or through the election. Thus, if $n_j' \leq 1$, then w_j^N strictly prefers to run. It follows directly that all agents in N run when $|N| \leq 2$.

Suppose $|N| > 2$. Suppose $n_j' > 1$. Recall that by equation (7), candidate w_i^N's payoff from winning against a candidate $w' > w_i^N$ is $\tilde{w}(\theta(w'), \tau(w')) = \varphi(\theta(w'), \tau(w'))w' > \varphi(\theta(w'), \tau(w'))w_i^N$. First, consider w_1^N and any strategy profile N_1' of the agents in N_1 such that $n_1' > 1$. Recall that $\sum_{w' \in N_1'} \pi(n_1')x_1(w') = \sum_{w' \in N_1'} \frac{2x_1(w')}{n_1'(n_1'-1)} = 1$ (see footnote 12) and note further that $\sum_{w' \in N_1'} \frac{1}{n_1'} = 1$. As $w' > w_1^N$ for all $w' \in N_1'$, it follows that $\varphi(\theta(w'), \tau(w'))w' > \varphi(\theta(w'), \tau(w'))w_1^N$ for all $w' \in N_1'$. Therefore, w_1^N's expected payoff from running is given by, adapting (2) for w_1^N and $n_1' > 1$, replacing $\pi(n_1'+1)$ and $\pi(n_1')$,

$$
\begin{aligned}
&\sum_{w' \in N_1'} \frac{2x_1(w')}{n_1'(n_1'+1)} \varphi(\theta(w'), \tau(w'))w_1^N + \sum_{w' \in N_1'} \frac{2}{n_1'(n_1'+1)} \varphi(\theta(w'), \tau(w'))w' \\
&= \frac{n_1'-1}{n_1'+1} \sum_{w' \in N_1'} \frac{2x_1(w')}{n_1'(n_1'-1)} \varphi(\theta(w'), \tau(w'))w_1^N + \left(1 - \frac{n_1'-1}{n_1'+1}\right) \sum_{w' \in N_1'} \frac{1}{n_1'} \varphi(\theta(w'), \tau(w'))w' \\
&> \sum_{w' \in N_1'} \frac{2x_1(w')}{n_1'(n_1'-1)} \varphi(\theta(w'), \tau(w'))w_1^N,
\end{aligned}
$$

which is w_1^N's expected payoff from not running, when adapting (1) for w_1^N and $n_1' > 1$. The strict inequality derives from the convex combination of two weighted averages of payoffs implied by the same regimes for two reasons. First, the first weighted average puts more weight on low-payoff regimes than on high-payoff ones: Given a set of potential candidates that want to run, agents with very productive projects would lose against many others and thus oftentimes determine the outcome when drawn as one of the candidates. Similarly, agents with very unproductive projects would win against many others and thus not as often determine the outcome when drawn as one of the candidates. It follows that low-producer-payoff regimes, due to more productive losers (see Proposition 1), are more likely—as they are the outcome of a larger number of pairs selected to run for office—than high-producer-payoff regimes, due to less productive losers—as they are the outcome of a smaller number of pairs selected to run for office. At the same time, the second weighted average weights all regime payoffs equally. Second, for each individual regime, the associated payoff for w_1^N is higher in the second weighted average, because $\varphi(\theta(w'), \tau(w'))w' > \varphi(\theta(w'), \tau(w'))w_1^N$ for all $w' \in N_1'$. Thus, for any N_1', $n_1' > 1$, w_1^N strictly prefers running over not running. Combining this conclusion with the case when $n_1' \leq 1$, for w_1^N running strictly dominates not running.

Next, consider agent w_2^N. Consider any strategy profile N_2' of the agents in N_2 such that $n_2' > 1$. If $w_1^N \notin N_2'$, then the analysis is exactly the same as for agent w_1^N above and w_2^N strictly prefers running over not running. Suppose that $w_1^N \in N_2'$. Then, since $x_2(w_1^N) = 0$ and $\varphi(\theta(w'), \tau(w'))w' > \varphi(\theta(w'), \tau(w'))w_2^N$ for all $w' \in N_2' \backslash \{w_1^N\}$ as well as, by Proposition 1, $\varphi(\theta(w_2^N), \tau(w_2^N))w_2^N > \varphi(\theta(w'), \tau(w'))w_2^N$ for all $w' \in N_2' \backslash \{w_1^N\}$, w_2^N's expected payoff from running is given by, adapting (2) for w_2^N and $n_2' > 1$, replacing $\pi(n_2'+1)$ and $\pi(n_2')$,

$$
\begin{aligned}
&\sum_{w' \in N_2'} \frac{2x_2(w')}{n_2'(n_2'+1)} \varphi(\theta(w'), \tau(w'))w_2^N + \sum_{w' \in N_2' \backslash \{w_1^N\}} \frac{2}{n_2'(n_2'+1)} \varphi(\theta(w'), \tau(w'))w' \\
&\quad + \frac{2}{n_2'(n_2'+1)} \varphi(\theta(w_2^N), \tau(w_2^N))w_2^N \\
&= \frac{n_2'-1}{n_2'+1} \sum_{w' \in N_2'} \frac{2x_2(w')}{n_2'(n_2'-1)} \varphi(\theta(w'), \tau(w'))w_2^N \\
&\quad + \left(1 - \frac{n_2'-1}{n_2'+1}\right) \left(\sum_{w' \in N_2' \backslash \{w_1^N\}} \frac{1}{n_2'} \varphi(\theta(w'), \tau(w'))w' + \frac{1}{n_2'} \varphi(\theta(w_2^N), \tau(w_2^N))w_2^N \right) \\
&> \sum_{w' \in N_2'} \frac{2x_2(w')}{n_2'(n_2'-1)} \varphi(\theta(w'), \tau(w'))w_2^N,
\end{aligned}
$$

which is w_2^N's expected payoff from not running, when adapting (1) for w_2^N and $n_2' > 1$. The strict inequality derives from the convex combination of two weighted averages of payoffs for three reasons. First, by the same argument as above, the first weighted average puts more weight on low-payoff regimes than on high-payoff ones, while the second one weights all regime payoffs equally. Second, the payoffs associated with all regimes included in both averages are higher for each regime in the second average. Third, while the second average includes all regimes included in the first, it includes an additional regime with an associated payoff that is greater than the payoffs associated with all regimes entering the first average. Therefore, for any N_2', $n_2' > 1$, $w_1^N \in N_2'$, w_2^N strictly prefers running over not running. Combining this conclusion with the cases when $w_1^N \notin N_2'$ and when $n_2' \leq 1$, respectively, for w_2^N running strictly dominates not running.

Next, consider agent w_n^N. Consider any strategy profile N_n' of the agents in N_n such that $w_1^N, w_2^N \in N_n'$, so that $n_n' \geq 2$. By Proposition 1, $\varphi(\theta(w_n^N), \tau(w_n^N))w_n^N < \varphi(\theta(w'), \tau(w'))w_n^N$ for all $w' \in N_n'$ so that w_n^N's expected payoff from running is, adapting (2) for w_n^N and $n_n' > 1$, replacing $\pi(n_n'+1)$ and $\pi(n_n')$,

$$
\begin{aligned}
&\sum_{w' \in N_n'} \frac{2x_n(w')}{n_n'(n_n'+1)} \varphi(\theta(w'), \tau(w'))w_n^N + \sum_{w' \in N_n'} \frac{2}{n_n'(n_n'+1)} \varphi(\theta(w_n^N), \tau(w_n^N))w_n^N \\
&= \sum_{w' \in N_n'} \frac{2x_n(w')}{n_n'(n_n'+1)} \varphi(\theta(w'), \tau(w'))w_n^N + n_n' \frac{2}{n_n'(n_n'+1)} \varphi(\theta(w_n^N), \tau(w_n^N))w_n^N
\end{aligned}
$$

$$= \frac{n'_n - 1}{n'_n + 1} \sum_{w' \in N'_n} \frac{2x_n(w')}{n'_n(n'_n - 1)} \varphi(\theta(w'), \tau(w')) w_n^N + \left(1 - \frac{n'_n - 1}{n'_n + 1}\right) \varphi(\theta(w_n^N), \tau(w_n^N)) w_n^N$$

$$< \sum_{w' \in N'_n} \frac{2x_n(w')}{n'_n(n'_n - 1)} \varphi(\theta(w'), \tau(w')) w_n^N,$$

which is w_n^N's expected payoff from not running, when adapting (1) for w_n^N and $n'_n > 1$. The strict inequality derives from the convex combination since $\sum_{w' \in N'_n} \frac{2x_n(w')}{n'_n(n'_n-1)} = 1$, so that $\sum_{w' \in N'_n} \frac{2x_n(w')}{n'_n(n'_n-1)} \varphi(\theta(w'), \tau(w')) w_n^N > \varphi(\theta(w_n^N), \tau(w_n^N)) w_n^N$, because $\varphi(\theta(w'), \tau(w')) w_n^N > \varphi(\theta(w_n^N), \tau(w_n^N)) w_n^N$ for all $w' \in N'_n$. That is, given that w_1^N and w_2^N run (i.e., their strictly dominated strategies of not running being eliminated), for w_n^N not running strictly dominates running.

Next, consider agent w_{n-1}^N. Consider any strategy profile N'_{n-1} of the agents in N_{n-1} with $w_1^N, w_2^N \in N'_{n-1}$ and $w_n^N \notin N'_{n-1}$. The problem for w_{n-1}^N now looks exactly as the one for w_n^N above. Thus, analysis and result are the same so that, given the iterated elimination of strictly dominated strategies, for w_{n-1}^N not running strictly dominates running. By iteration, the same argument then holds for agents $w_{n-2}^N, \ldots, w_3^N$. That is, only w_1^N and w_2^N select themselves into running and therefore run for office. ■

Proposition 3

Proof. In equilibrium, the agent that determines the outcome is the second smallest element of the set N, w_2^N. It follows directly from Proposition 1 that a larger n, which decreases $w_2^N = w_{p+2-n}$, implies better enforcement and more secure property rights. ■

Proposition 4

Proof. Any admissible electorate has at least one appropriator and the majority of voters are producers. By assuming $p - 2 > a > 0$, these are also the only assumptions made in the case when the whole population can vote. Therefore, the entire analysis and thus the equilibrium outcome are exactly the same as if the whole population were allowed to vote. ■

Proposition 5

Proof. Suppose the regime (θ, τ) wins the election with positive probability in equilibrium. That is, the regime (θ, τ) must make appropriators at least indifferent between both proposed regimes. Suppose $\tau = 1$. Then, both regimes must be offering a zero payoff to all agents. At least one candidate has a positive probability of a zero payoff and can profitably deviate to $(1, 1 - \epsilon)$ for a small enough $\epsilon > 0$, offering appropriators a positive payoff, to win a positive payoff arbitrarily close to the dictator payoff with certainty, a contradiction. So, $\tau < 1$. Suppose $\theta < 1$. Then, there are two cases: if the proposer's payoff from losing the election is greater than that from winning it, then there is a profitable deviation to proposing the dictator regime so as to lose the election with certainty; if the proposer's payoff from losing the election is less than or equal to that from winning it, then there is a profitable deviation to proposing $(\theta+\epsilon,\tau)$, $\epsilon>0$, to win with certainty, as all appropriators prefer $(\theta+\epsilon,\tau)$, and enjoy a higher payoff, a contradiction. Thus, $\theta=1$. Suppose $(\theta,\tau)=(1,\tau)$ for some $\tau>0$. Then, a candidate with a positive probability of losing and getting $\varphi(1,\tau)w=0$ can profitably deviate to $(1,\tau-\epsilon)$ for a small enough $\epsilon>0$ to win the election and a positive payoff in office with certainty, a contradiction. Thus, $(\theta,\tau)=(1,0)$, which is anarchy and gives appropriators the highest possible payoff. Suppose only one candidate proposes $(1,0)$. Then, that candidate wins but can profitably deviate to $(1,\epsilon)$ for a small enough $\epsilon>0$ to get a positive payoff in office, a contradiction. Thus, both candidates propose $(1,0)$. No candidate can profitably deviate. Except those of appropriators, all payoffs are zero. In the selection game, any profile with at least one agent running is an equilibrium. If nobody ran, then deviating to running yields the dictator payoff, a contradiction. If at least one agent runs, then deviating to running or not running, respectively, yields zero and is not profitable. The outcome is a dictatorship if only one agent runs and anarchy otherwise. ■

Proposition 6

Proof. This proof replicates the proof of Proposition 1 up to a point from which on it proceeds in exactly the same way. At that point, I conclude that all other proofs and thus results go through without further changes, except for carrying around a factor γ.

In the political game, consider the candidates w_L and w_H proposing the regimes (θ_L,τ_L) and (θ_H,τ_H), respectively. I proceed in steps to describe what an equilibrium has to look like, find all candidate equilibria (all of which have the same unique winning regime), and show that they in fact are equilibria. Where convenient, let

$$\hat{\tilde{w}}(\theta,\tau;w)=\tilde{w}(\theta,\tau)+\varphi(\theta,\tau)(1-\gamma)w=\tau-g(1-\theta)+(1-\theta)(1-\tau)(1-\gamma)w,$$

which is strictly increasing in τ everywhere because $1>(1-\theta)(1-\gamma)w$.

1. *In equilibrium, the proposed regimes (θ,τ) and (θ',τ') satisfy $\varphi(\theta,\tau)=\varphi(\theta',\tau')>0$.* Suppose for a contradiction that $\varphi(\theta,\tau)\neq\varphi(\theta',\tau')$. Without loss of generality assume that w proposes the regime (θ,τ) such that $\varphi(\theta,\tau)>\varphi(\theta',\tau')$, which means that w wins the election with certainty and payoff $\hat{\tilde{w}}(\theta,\tau;w)$. Note that $\varphi(\theta,\tau)>\varphi(\theta',\tau')\geq 0$ implies that $(1-\theta)>0$ and $(1-\tau)>0$. Then, w can deviate to proposing $(\theta'',\tau'')=(\theta,\tau+\epsilon)$ for a small enough $\epsilon>0$ and reduce $(1-\tau)$ slightly so that, by continuity, $\varphi(\theta'',\tau'')>\varphi(\theta',\tau')$ and w still wins, with a higher payoff because $\hat{\tilde{w}}(\theta,\tau;w)$ is strictly increasing in τ, a contradiction. Thus, $\varphi(\theta,\tau)=\varphi(\theta',\tau')$. Now, suppose for a contradiction that $\varphi(\theta,\tau)=\varphi(\theta',\tau')=0$. At least one of the candidates has a positive probability of losing and thus getting a payoff of 0.

By continuity, that candidate can profitably deviate to proposing $(\theta'', \tau'') = (1-\epsilon, 1-\epsilon)$ for a small enough $\epsilon > 0$ to win the election with certainty, as $\varphi(\theta'', \tau'') > 0$, and enjoy a higher expected payoff because $\hat{\tilde{w}}(\theta'', \tau''; w)$ can be made arbitrarily close to the dictator payoff, a contradiction.

2. *In equilibrium, if w_o proposes (θ, τ) and wins the election with positive probability over the opponent's regime proposal (θ', τ'), then $\hat{\tilde{w}}(\theta, \tau; w_o) \geq \varphi(\theta', \tau')w_o$.* Suppose for a contradiction that $\varphi(\theta', \tau')w_o > \hat{\tilde{w}}(\theta, \tau; w_o)$. Then, w_o can profitably deviate to proposing $(\theta'', \tau'') = (\theta, 1)$, which loses the election with certainty, as $\varphi(\theta', \tau') > 0 = \varphi(\theta'', \tau'')$, thereby giving w_o a higher expected payoff, a contradiction.

3. *In equilibrium, if w_o proposes (θ, τ) and wins the election with positive probability over the opponent's regime proposal (θ', τ'), then $\hat{\tilde{w}}(\theta, \tau; w_o) \geq \hat{\tilde{w}}(\theta', \tau'; w_o)$.* Suppose for a contradiction that $\hat{\tilde{w}}(\theta', \tau'; w_o) > \hat{\tilde{w}}(\theta, \tau; w_o) \geq \varphi(\theta', \tau')w_o > 0$, where the last two inequalities derive from steps **2** and **1**. Then, by continuity, w_o can profitably deviate to proposing the regime $(\theta'', \tau'') = (\theta', \tau' - \epsilon)$ for a small enough $\epsilon > 0$, such that $\hat{\tilde{w}}(\theta'', \tau''; w_o) > \hat{\tilde{w}}(\theta, \tau; w_o) \geq \varphi(\theta', \tau')w_o$, to win the election with certainty, as it offers all voters a strictly higher payoff than (θ', τ'), and enjoy a higher expected payoff, a contradiction.

4. *In equilibrium, if w_{-o} proposes (θ', τ') and loses with positive probability against the opponent's regime proposal (θ, τ), then $\varphi(\theta, \tau)w_{-o} \geq \hat{\tilde{w}}(\theta, \tau; w_{-o})$.* Suppose for a contradiction that $\hat{\tilde{w}}(\theta, \tau; w_{-o}) > \varphi(\theta, \tau)w_{-o} > 0$. Note that $\hat{\tilde{w}}(\theta, \tau; w_{-o}) \geq \hat{\tilde{w}}(\theta', \tau'; w_{-o})$ by step **3**, as (θ, τ) wins with positive probability, and step **1**. Then, by continuity, w_{-o} can profitably deviate to proposing $(\theta'', \tau'') = (\theta, \tau - \epsilon)$ for a small enough $\epsilon > 0$, win the election with certainty, as (θ'', τ'') offers all voters a strictly higher payoff than (θ, τ), and enjoy a higher expected payoff than before, a contradiction.

5. *In equilibrium, $(\theta_L, \tau_L) \neq (\theta_H, \tau_H)$.* Suppose for a contradiction that $(\theta_L, \tau_L) = (\theta_H, \tau_H) = (\theta, \tau)$. Then, each candidate wins with positive probability. Thus, it must hold from steps **2** and **4** that $\hat{\tilde{w}}(\theta, \tau; w_L) = \varphi(\theta, \tau)w_L$ and $\hat{\tilde{w}}(\theta, \tau; w_H) = \varphi(\theta, \tau)w_H$, or

$$\tilde{w}(\theta, \tau) + \varphi(\theta, \tau)(1-\gamma)w_L = \varphi(\theta, \tau)w_L \;\;\Rightarrow\;\; \tilde{w}(\theta, \tau) = \varphi(\theta, \tau)\gamma w_L,$$
$$\tilde{w}(\theta, \tau) + \varphi(\theta, \tau)(1-\gamma)w_H = \varphi(\theta, \tau)w_H \;\;\Rightarrow\;\; \tilde{w}(\theta, \tau) = \varphi(\theta, \tau)\gamma w_H,$$

implying $\tilde{w}(\theta, \tau) = \varphi(\theta, \tau)\gamma w_H > \varphi(\theta, \tau)\gamma w_L = \tilde{w}(\theta, \tau)$, a contradiction.

6. *Candidate w_L wins with certainty.* Suppose for a contradiction that w_H wins the election with positive probability. Then, by step **2**, since $\hat{\tilde{w}}(\theta_H, \tau_H; w_H) \geq \varphi(\theta_L, \tau_L)w_H = \varphi(\theta_H, \tau_H)w_H$, because $\varphi(\theta_L, \tau_L) = \varphi(\theta_H, \tau_H)$, it must hold that $\tilde{w}(\theta_H, \tau_H) \geq \varphi(\theta_H, \tau_H)\gamma w_H > \varphi(\theta_H, \tau_H)\gamma w_L$. It then follows that $\tilde{w}(\theta_H, \tau_H) + \varphi(\theta_H, \tau_H)(1-\gamma)w_L > \varphi(\theta_H, \tau_H)\gamma w_L + \varphi(\theta_H, \tau_H)(1-\gamma)w_L$, implying that $\hat{\tilde{w}}(\theta_H, \tau_H; w_L) > \varphi(\theta_H, \tau_H)w_L$, which contradicts the result in step **4**, because w_L loses with positive probability.

7. *In equilibrium, the regime (θ_L, τ_L) that wins the election with certainty solves*

$$\text{(P}'\text{)} \qquad \max_{(\theta,\tau)\in[0,1]^2} \tilde{w}(\theta,\tau) + \varphi(\theta,\tau)(1-\gamma)w_L \quad s.t. \quad \varphi(\theta,\tau) \geq \bar{\varphi} \equiv \varphi(\theta_H, \tau_H).$$

Suppose for a contradiction that (θ_L, τ_L) wins the election with certainty and violates the constraint so that $\varphi(\theta_L, \tau_L) < \varphi(\theta_H, \tau_H)$. Then, (θ_H, τ_H) wins the election with certainty, a contradiction. Suppose for a contradiction that (θ_L, τ_L) wins the election with certainty but does not solve (P′). Then, there is a (θ', τ') such that $\hat{\tilde{w}}(\theta', \tau'; w_L) > \hat{\tilde{w}}(\theta_L, \tau_L; w_L)$ and $\varphi(\theta', \tau') \geq \bar{\varphi}$. Then, by continuity, w_L could deviate to proposing $(\theta'', \tau'') = (\theta', \tau' - \epsilon)$ for a small enough $\epsilon > 0$ so that $\hat{\tilde{w}}(\theta', \tau' - \epsilon; w_L) > \hat{\tilde{w}}(\theta_L, \tau_L; w_L)$ and $\varphi(\theta', \tau' - \epsilon) > \varphi(\theta', \tau') \geq \bar{\varphi} = \varphi(\theta_H, \tau_H)$ to win the election with certainty and enjoy a higher payoff, a contradiction. Thus, as Problem (P′) has a solution and the objective function is quasiconcave in (θ, τ) by assumption, solving Problem (P′) (note that $\theta < 1$ and $\tau < 1$), (θ_L, τ_L) and (θ_H, τ_H) satisfy

$$g'(1-\theta_L)(1-\theta_L) = (1-\tau_L), \tag{11}$$

$$\varphi(\theta_H, \tau_H) = \varphi(\theta_L, \tau_L). \tag{12}$$

Notice that a solution (θ_L, τ_L) to Problem (P′) is independent of the productivity w_L of the agent who solves it.

8. *In equilibrium, $\varphi(\theta_L, \tau_L)w_H = \hat{\tilde{w}}(\theta_L, \tau_L; w_H)$.* As w_L wins, from steps **4** and **2**, $\varphi(\theta_L, \tau_L)w_H \geq \hat{\tilde{w}}(\theta_L, \tau_L; w_H) > \hat{\tilde{w}}(\theta_L, \tau_L; w_L) \geq \varphi(\theta_H, \tau_H)w_L$. Suppose for a contradiction that $\varphi(\theta_L, \tau_L)w_H > \hat{\tilde{w}}(\theta_L, \tau_L; w_H)$. As (θ_L, τ_L) solves Problem (P′), the solution to which is independent of the productivity w_L as implied by (11)–(12), and $\varphi(\theta_L, \tau_L) = \varphi(\theta_H, \tau_H)$, the highest in-office payoff a regime (θ', τ') with positive probability of winning can promise w_H is $\hat{\tilde{w}}(\theta_L, \tau_L; w_H)$, which is less than w_H's payoff from losing. Thus, producers, who are the majority, are indifferent between the proposed regimes and candidate w_H runs for office despite, given w_L's proposal, all winning platforms give a payoff in office that is lower than the payoff from losing. The same is not true for w_L. Therefore, due to the preference shock, with probability $\varepsilon > 0$, the majority of voters vote for w_H, who thus wins the election with positive probability, a contradiction. Therefore,

$$\varphi(\theta_L, \tau_L)w_H = \tilde{w}(\theta_L, \tau_L) + \varphi(\theta_L, \tau_L)(1-\gamma)w_H. \tag{13}$$

9. *In equilibrium, $\nu(\theta_L, \tau_L) > \nu(\theta_H, \tau_H)$ so that $\theta_H < \theta_L$.* Suppose for a contradiction that $\nu(\theta_L, \tau_L) \leq \nu(\theta_H, \tau_H)$. As $\varphi(\theta_L, \tau_L) = \varphi(\theta_H, \tau_H)$, w_H wins with positive probability, a contradiction. Thus, $\nu(\theta_L, \tau_L) > \nu(\theta_H, \tau_H)$, that is, $\theta_L(1-\tau_L) > \theta_H(1-\tau_H)$, which with $\varphi(\theta_L, \tau_L) = \varphi(\theta_H, \tau_H)$ implies $(1-\tau_L) > (1-\tau_H)$. Thus, $(1-\theta_L) < (1-\theta_H)$ or

$$\theta_H < \theta_L. \tag{14}$$

10. Collecting equations (11)–(14) gives

$$\varphi(\theta_L, \tau_L)\gamma w_H = \tau_L - g(1-\theta_L), \tag{15}$$

$$g'(1-\theta_L)(1-\theta_L) = (1-\tau_L) \tag{16}$$

$$\varphi(\theta_H, \tau_H) = \varphi(\theta_L, \tau_L) \text{ and } \theta_H < \theta_L. \tag{17}$$

By construction, given (θ_H, τ_H), w_L cannot increase expected payoffs by deviating. No other proposal that wins with positive probability gives a higher in-office payoff. Deviating to proposing a regime that loses the election, w_L would earn a strictly smaller payoff, because, as (θ_L, τ_L) satisfies (15),

$$\begin{aligned} \tilde{w}(\theta_L, \tau_L) &= \varphi(\theta_L, \tau_L)\gamma w_H > \varphi(\theta_L, \tau_L)\gamma w_L \\ \Rightarrow\ \tilde{w}(\theta_L, \tau_L) + \varphi(\theta_L, \tau_L)(1-\gamma)w_L &> \varphi(\theta_L, \tau_L)w_L = \varphi(\theta_H, \tau_H)w_L, \end{aligned}$$

where the last equality follows from (17). Similarly, given (θ_L, τ_L), w_H cannot increase expected payoffs by deviating. Any deviation that still loses the election does not change payoffs and, as the solution to the Problem (P′) is independent of the productivity of the agent who solves it, the maximal in-office payoff of a proposal (θ', τ') that gives w_H a positive probability of winning, and thus observes $\varphi(\theta', \tau') \geq \varphi(\theta_L, \tau_L) = \varphi(\theta_H, \tau_H)$, is $\tilde{w}(\theta_L, \tau_L) + \varphi(\theta_L, \tau_L)(1-\gamma)w_H = \varphi(\theta_L, \tau_L)w_H$, where the equality follows from (15). Thus, the set of proposals described is an equilibrium.
Finally, the system (15)–(17) is exactly the same as the system (7)–(9), except for the factor $\gamma > 0$ multiplying w_H in equation (15). It follows that the rest of the description of the equilibrium regimes is exactly as before, except for γ multiplying w_H. Therefore, the description of the equilibrium of the political game and the effects of variations in the productivity w_H of the election loser are exactly as before. It follows that the equilibrium of the selection game is exactly as before; the payoff functions and the proof of Proposition 2 need only one adjustment: abusing notation as before, from (15), w_i^N's payoff from winning against a candidate $w' > w_i^N$, $\hat{\tilde{w}}(\theta(w'), \tau(w'); w_i^N) = \tilde{w}(\theta(w'), \tau(w')) + \varphi(\theta(w'), \tau(w'))(1-\gamma)w_i^N$, equals

$$\varphi(\theta(w'), \tau(w'))\gamma w' + \varphi(\theta(w'), \tau(w'))(1-\gamma)w_i^N > \varphi(\theta(w'), \tau(w'))w_i^N,$$

as $\gamma > 0$, replacing the previously relevant relation implied by equation (7), which was

$$\tilde{w}(\theta(w'), \tau(w')) = \varphi(\theta(w'), \tau(w'))w' > \varphi(\theta(w'), \tau(w'))w_i^N.$$

All other results therefore also follow without further qualification, completing the proof. ■

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