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THE FORM OF PROPERTY RIGHTS: OLIGARCHIC VS. DEMOCRATIC SOCIETIES

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ABSTRACT

This paper develops a model where this is a trade-off between the enforcement of the property rights of different groups. An "oligarchic" society, where political power is in the hands of major producers, protects their property rights, but also tends to erect significant entry barriers, violating the property rights of future producers. Democracy, where political power is more widely diffuesed, imposes redistributive taxes on the producers, but tends to avoid entry barriers. When taxes in democracy are high and the distortions caused by entry barriers are low, an oligarchic society achieves greater efficiency. Nevertheless, because comparative advantage in entreprenuership shifts away from the incumbents, the inefficiency created by entry barriers in oligarchy deteriorates over time. The typical pattern is therefore one of the rise and decline of oligarchic societies: of two otherwise identical societies, the one with an oligarchic organization will first become richer, but later fall behind the democratic society. I also discuss how democratic societies may be better able to take advantage of new technologies, and how the unequal distribution of income in an oligarchic society supports the oligarchic institutions and may keep them in place even when the become significantly costly to society.

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1 Introduction

There is now a growing consensus that institutions protecting the property rights of producers are essential for successful long-run economic performance.[1] There is no agreement, however, on what constitutes "protecting the property rights of producers" or on the costs and benefits of various different "forms of property rights". One possibility is an *oligarchic* society where political power is in the hands of the economic elite, for example, the major producers/investors in the economy. This type of organization not only ensures that major producers do not fear expropriation or high rates of taxation, but also typically enables them to create a non-level playing field and a monopoly position for themselves, in essence violating the property rights of future potential producers (i.e., excluding them from taking advantage of profit opportunities). The alternative is *democracy* (or perhaps more appropriately, populist democracy), where political power is more equally distributed, thus effectively in the hands of poorer agents who can use their power to tax the producers' profits.[2] But in return, incumbent producers will be unable to create significant entry barriers against entrants, ensuring better property rights for future potential producers.[3]

This paper constructs a simple model to analyze the trade-off between oligarchic and democratic societies. The model features two policy distortions: taxation and entry barriers. Taxes, which redistribute income from entrepreneurs to workers, are distortionary because they discourage entrepreneurial investment. Entry barriers, which redistribute income towards the entrepreneurs by reducing labor demand and depressing wages, distort the allocation of resources because they prevent the entry of more productive agents into entrepreneurship.[4]

[1] See, among others, the general discussions in Jones (1981), North (1981), and Olson (1982), and the empirical evidence in De Long and Shleifer (1993), Knack and Keefer (1995), Barro (1999), Hall and Jones (1999), and Acemoglu, Johnson and Robinson (2001, 2002).

[2] Although there is a close connection between dictatorship and oligarchy, some electoral democracies may be "oligarchic" according to the definition here, because the economic elite controls the parties or the electoral agenda.

[3] In certain societies such as in Zaire under Mobutu, a highly predatory state, controlled either by an individual or the political elite, may violate the property rights of both incumbent and future producers. The focus here is not these cases, but the trade-offs between distortionary redistributive taxation and entry barriers. A full taxonomy of regimes would distinguish predatory regimes from oligarchic and democratic regimes.

[4] Entry barriers may take the form of direct regulation, or of policies that reduce the costs of inputs, especially of capital, for the incumbents, while raising them for potential rivals. Cheap loans and subsidies to the chaebol appear to have been a major entry barrier for new firms in South Korea (see, for example, Kang, 2002). See also La Porta, Lopez-de-Silanes and Shleifer (2003) on the implications of government ownership of banks, which often enables incumbents to receive subsidized credit, thus creating entry

The trade-off between these two different types of distortions determines whether an oligarchic or a democratic society is more efficient and generates greater aggregate output. Oligarchy avoids the disincentive effects of taxation, but suffers from the distortions introduced by entry barriers. Democracy imposes higher redistributive taxes, but also tends to create a more level playing field.[5] When the taxes that a democratic society will impose are high and the distortions caused by entry barriers are low, oligarchy achieves greater efficiency and generates higher output; when democratic taxes are relatively low and entry barriers create significant misallocation of resources, a democratic society achieves greater aggregate output. In addition, a democratic society typically generates a more equal distribution of income than an oligarchic society, because it redistributes income from entrepreneurs to workers, while an oligarchic society adopts policies that reduce labor demand, depress wages and increase the profits of incumbents.

More interesting are the dynamic trade-offs between these political regimes. Initially, entrepreneurs will tend to be those with greater productivity, so an oligarchic society generates only limited distortions. However, as long as comparative advantage in entrepreneurship changes over time, it will eventually shift away from the incumbents, and the entry barriers erected in oligarchy will become increasingly costly to efficiency. A typical pattern is therefore one where, of two otherwise identical societies, the oligarchy will first become richer, but later fall behind the democratic society. The model therefore suggests that, at least under some parameter configurations, despite its potential economic distortions, democracy is better for long-run economic performance than the alternatives.

I also show that democracies may be able to take better advantage of new technologies than oligarchic societies. This is because democracy allows agents with comparative advantage in new technology to enter entrepreneurship, while oligarchy typically blocks new entry.

The above discussion takes the political regime and the distribution of political power, in particular whether the society is oligarchic or democratic, as given. A major area of research in political economy is the determination of equilibrium political institutions.

barriers for potential entrants. An interesting case in this context is Mexico at the end of the nineteenth century, where the rich elite controlled a highly concentrated banking system, protected by entry barriers, and the resulting lack of loans for new entrants enabled the elite to maintain a monopoly position in other sectors. See Haber (1991, 2002).

[5] This argument does not deny the presence of entry barriers in democratic societies, for example in much of Western Europe, but suggests that the role of entry barriers in these instances may be to create rents to a specific group of workers rather than protecting incumbent firms (on cross-country patterns of labor regulation, see Djankov, La Porta, Lopez-de-Silanes and Shleifer, 2003).

When should we expect a society to become oligarchic and remain so even when this becomes increasingly costly? I analyze this question by embedding the basic setup in a simple (and reduced-form) model of regime change where groups with greater economic power are also more likely to prevail politically. Social groups that become substantially richer in a given political regime may be able to successfully sustain that regime and protect their privileged position. In oligarchy, incumbents have the political power to erect entry barriers to raise their profits. These greater profits, in turn, increase their political power, making a switch from oligarchy to democracy more difficult, even when entry barriers become significantly costly.

Although the model economy analyzed in this paper is highly abstract, it nonetheless sheds light on a number of interesting questions. The first set of issues is the relative economic performance of democratic and oligarchic societies. In practice, there are examples of both democratic and oligarchic societies that have achieved high rates of economic growth. For example, the United States and much of Western Europe during the postwar era illustrate the potential economic success of democratic societies. In contrast, Japan both in the prewar and the postwar periods, and South Korea, Taiwan, and Singapore in the postwar era are examples of oligarchic societies that have pursued pro-business policies and achieved successful economic performance.[6] The development experiences of Brazil and Mexico, on the other hand, illustrate both the potential gains and significant costs of oligarchic regimes. Haber (2003), for example, explains how import-substitution policies in these countries were adopted to protect the businesses of the rich elite aligned with the government.[7] He further documents how these import-substitution policies enabled

[6] All four countries approximate oligarchic societies. For example, in Japan, the pre-war era is commonly recognized as highly oligarchic, with the conglomerates known as the *zaibatsu* dominating both politics and the economy (the title of the book on pre-war Japanese politics by Ramseyer and Rosenbluth, 1995, is *Politics of Oligarchy*). The postwar politics in Japan, on the other hand, have been dominated by the Liberal Democratic Party (LDP), which is closely connected to the business elite (see, for example, Ramseyer and Rosenbluth, 1997, and Jansen, 2000). In the Korean case, the close links between the large family-run conglomerates, the *chaebol*, and the politicians are well-documented (see, for example, Kang, 2002). In both cases, government policy has been favorable to major producers and provided them with subsidized loans and protected internal markets as well as secure property rights (e.g., Johnson, 1982, Evans, 1995). For example, in Japan, the Antimonopoly Act of 1947 imposed by the Americans was soon relaxed, and the LDP introduced various anticompetitive statutes to protect existing businesses. Ramseyer and Rosenbluth report that in 1980 there were 491 cartels, and "almost half [of those] had been in effect for twenty-five years and over two-thirds for more than twenty years" (1997, p. 132). However, it should also be noted that inequality of income in both cases has been limited, most likely because of other historical reasons, for example, the extensive land reforms in South Korea undertaken to defuse rural unrest fanned by the Communist regime in the North (e.g., Haggard, 1990).

[7] For example, he describes the formulation of policies in early 20th-century Mexico as "Manufacturers who were part of the political coalition that supported the dictator Porfirio Diaz were granted protection,

rapid industrialization both before and after World War II, but also created significant distortions and economic problems.

Beyond these selective examples, cross-country empirical analyses, e.g., Barro (1999), show that in the postwar era, electoral democracies have not grown faster than dictatorships (which generally correspond to oligarchic societies in terms of the model), despite the well-documented presence of disastrous dictatorships with very weak records of property rights enforcement. The model is consistent with this pattern, because both democratic and oligarchic societies create distortions. Successful economic performances will come from democracies that are relatively less redistributive, and from oligarchic societies where entry barriers are limited or where heterogeneity of productivity in entrepreneurship is relatively unimportant.

Existing evidence is also consistent with the notion that democracies are more redistributive, but introduce fewer entry barriers than oligarchies. For example, Djankov et al. (2002, Table 7) show that there are more entry barriers in non-democracies than democracies. Rodrik (1999) shows that labor share and wages are typically higher in democracies than in dictatorships. Democracies also appear to tax more than non-democratic countries. Figure 1 shows a significant positive correlation between tax revenue over GDP against the Freedom House measure of democracy, once the effect of log GDP per capita has been taken out from both variables. Appendix B demonstrates that this pattern is robust to controlling for education, population, continent dummies, and to excluding former communist countries and federal countries.[8]

The second set of questions that the model might shed some light on relate to the rise and decline of nations. A common conjecture in social sciences is that economic success also lays the seeds of future failures (e.g., Kennedy, 1987, Olson, 1982). The analysis in this paper suggests a specific mechanism formalizing this conjecture: early success might often come from providing security to major producers, who then use their political power to prevent entry by new groups, creating dynamic distortions. This mechanism is illustrated by the contrast between the economic histories of the Northeastern United States and the Caribbean during the 17th, 18th, and 19th centuries.

everyone else was out in the cold" (p. 18), and during the later era, "manufacturers could lobby the executive branch of government, which could then, without the need to seek legislative approval, restrict the importation of competing products" (p. 48).

[8]Moreover, at least part of the economic problems of some democracies also seem to stem from "anti-business" policies. See, for example, Besley and Burgess (2003) for an interesting analysis of the economic costs of pro-labor regulation in India.

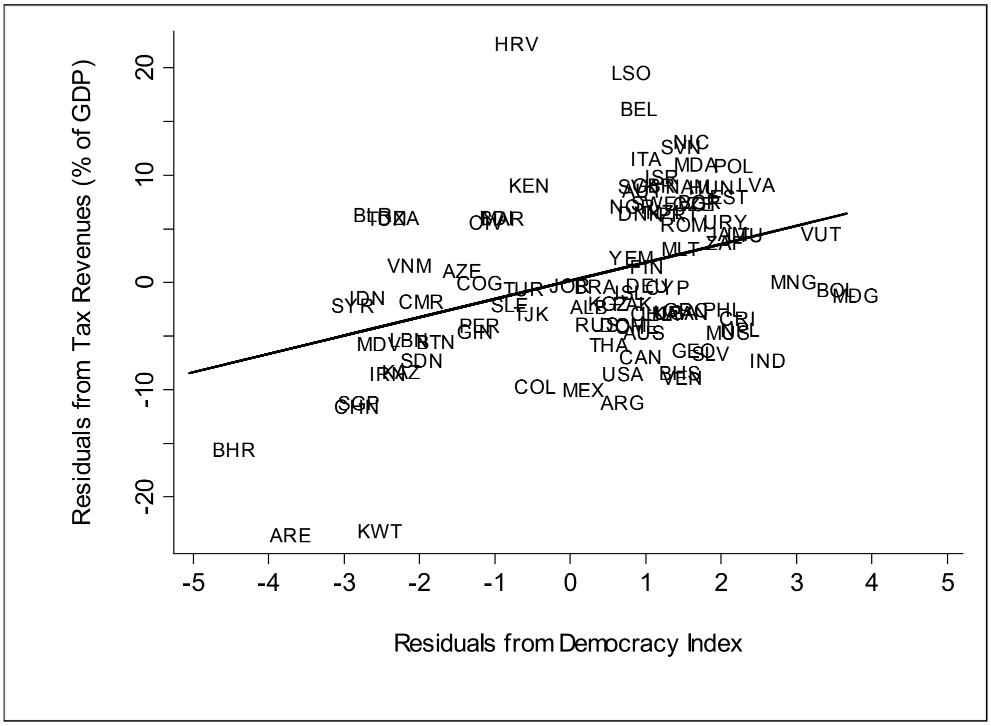

Figure 1: Residuals of tax revenues as a percentage of GDP in 1998 vs. residuals of Freedom House democracy index in 1997-98. Both residuals are from a regression of the corresponding variables on log GDP per capita in 1998. See Appendix B.

The Northeastern United States developed as a typical settler colony, approximating a democratic society with significant political power in the hands of smallholders (e.g., Galenson, 1996).[9] In contrast, the Caribbean colonies were clear examples of oligarchic societies, with political power in the monopoly of plantation owners, and few rights for the slaves that made up the majority of the population (see, e.g., Beckford, 1972, and Dunn, 1972). In both the 17th and 18th centuries, the Caribbean societies were among the richest places in the world, and almost certainly richer and more productive than the Northeastern United States (see, e.g., Acemoglu, Johnson and Robinson, 2002, Coatsworth, 1993, Eltis, 1995, Engerman, 1981, and Engerman and Sokoloff, 1997). Although the wealth of the Caribbean undoubtedly owed much to the world value of its main produce, sugar, it seems that Caribbean societies were able to achieve these levels of productivity because the planters had every incentive to invest in the production, processing and export of sugar. But starting in the late 18th century, the Caribbean economies lagged behind the United

[9]This is a relative statement, not meant to deny the significant power of rich industrialists and landowners in the 19th-century United States (see, e.g., Beard, 1952).

States and many other more democratic societies, which took advantage of new investment opportunities, particularly in industry and commerce (Acemoglu, Johnson and Robinson, 2002, and Engerman and Sokoloff, 1997). While new entrepreneurs in the United States and Western Europe invested in these areas, power in the Caribbean remained in the hands of the planters, who had no interest in encouraging entry by new groups.[10] Though not as stark as the contrast between the Northeastern United States and the Caribbean, the experiences of other oligarchic societies, including those of Japan, South Korea, Brazil, and Mexico, where initial growth supported by close relations between major producers and the government has shown a tendency to come to an end, are also consistent with the mechanism emphasized in this paper.

Many studies on economic growth and the political economy of development have pointed out the costs of entry barriers, while others have emphasized the disincentive effects of redistributive taxation. For example, the classic by North and Thomas forcefully articulates the view that monopoly arrangements are the most important barrier to growth, and cite "the elimination of many of the remnants of feudal servitude,..., the joint stock company, replacing the old regulated company" and "the decay of industrial regulation and the declining power of guilds" as key foundations for the Industrial Revolution in Britain (1973, p. 155). This point of view is also developed in Parente and Prescott (1999), and in the recent book by Rajan and Zingales, where they emphasize the threat to successful capitalism from the "incumbents, those who already have an established position in the marketplace and would prefer to see it remain exclusive." (2003, p. 18). An even larger literature, on the other hand, focuses on the cost of redistribution. For example, Romer (1975), Roberts (1977), Meltzer and Richard (1981), Persson and Tabellini (1994), and Alesina and Rodrik (1994) all construct models in which the median voter chooses high levels of redistributive taxation, distorting saving, investment or labor supply decisions (see also Benabou, 2000, on how, under certain circumstances, democracy may not generate enough redistribution). Barro succinctly summarizes the costs of a democratic regime as "...the tendency to enact rich-to-poor redistribution of income (including land reforms) in systems of majority voting and the possibly enhanced role of interest groups in systems with representative legislatures." (1999, p. 49). Nevertheless, I am not aware of any analysis that relates the distortions created by redistributive democracy and those caused by entry barriers in oligarchy as the two sides of the trade-off over

[10] Sokoloff and Kahn (1990) and Kahn and Sokoloff (1993) show that many of the major U.S. inventors in the 19th century were not members of the already-established economic elite, but new comers with diverse backgrounds.

the "form of property rights", nor any analysis of the dynamic costs of oligarchy.

Other closely related papers include Krusell and Rios-Rull (1996), Acemoglu, Aghion and Zilibotti (2003), Leamer (1998), Robinson and Nugent (2001), and Galor, Moav and Vollrath (2003). The result of potential cycles in oligarchy in the current model is related to the political-economic cycles in Krusell and Rios-Rull (1994). In their model, technology-specific investments create vested interests opposed to the introduction of new technologies. The political power of these vested interests may lead to growth cycles. Acemoglu, Aghion and Zilibotti (2003) develop a theory where protecting large firms at the early stages of development is beneficial because it relaxes potential credit constraints, but such protection becomes progressively more costly as the economy approaches the world technology frontier and selecting the right entrepreneurs becomes more important. That paper also provides some empirical evidence that economies with high levels of entry and international trade restrictions suffer severe growth slowdowns as they approach the world technology frontier. Finally, Leamer (1998), Robinson and Nugent (2001) and Galor, Moav and Vollrath (2003) discuss the potential opposition of landowners to investment in human capital. For example, Galor et al. emphasize how land abundance may initially lead to greater income per capita, but later retard human capital accumulation and economic development. None of these papers contrasts the trade-offs between democracy and oligarchy or identifies the dynamic costs of oligarchy.

The rest of the paper is organized as follows. Section 2 describes the economic environment, and characterizes the equilibrium for a given sequence of policies. Section 3 analyzes the political equilibrium in democracy and oligarchy, and compares the outcomes. Section 4 discusses a simple model of changes of regime between oligarchy and democracy. Section 5 concludes.

2 The Model

2.1 The Environment

I consider a non-overlapping generations economy consisting of a continuum 1 of dynasties. There is a unique final good which can be used for consumption or for bequest. Each agent has a single offspring, and is imperfectly altruistic with the utility function:

$$U_t^j = (1-\beta)^{-(1-\beta)}\beta^{-\beta}\left(c_t^j\right)^{1-\beta}\left(b_{t+1}^j\right)^{\beta} - z_t^j, \tag{1}$$

where c_t^j is the consumption of agent j at time t, b_{t+1}^j is the bequest he leaves to his offspring, and z_t^j is the (non-pecuniary) cost of effort that the agent incurs if he becomes an entrepreneur.

This utility function is convenient since it implies a constant savings rule for each agent of the form:

$$b_{t+1}^j = \beta \tilde{W}_t^j, \tag{2}$$

where $\tilde{W}_t^j$ is the total income of the agent at time t. It also implies that the indirect utility function of agent j at time t is simply given by $U_t^j = \tilde{W}_t^j - z_t^j$. Total income is in turn the sum of earned income, W_t^j, and bequests, b_t^j, i.e., $\tilde{W}_t^j = W_t^j + b_t^j$.

I assume that each dynasty disappears (dies) with a small probability ε in every period, and a mass ε of new dynasties are born. I will consider the limit of this economy with $\varepsilon \to 0$. The reason for introducing the possibility of death is to avoid the case where the supply of labor is exactly equal to the demand for labor for a range of wage rates, which can otherwise arise in the oligarchic equilibrium. In other words, in the economy with $\varepsilon = 0$, there may also exist other equilibria, and in this case, the limit $\varepsilon \to 0$ picks a specific one from the set of equilibria.

The key distinction in this economy is between production workers on the one hand and capitalists/entrepreneurs on the other. Each agent can either be employed as a worker or set up a firm to become an entrepreneur.[11] While all agents have the same productivity as workers, their productivity in entrepreneurship differs. In particular, agent j at time t has entrepreneurial talent $a_t^j \in \{A^L, A^H\}$ with $A^L < A^H$. To become an entrepreneur, an agent needs to set up a firm, or alternatively, he could inherit the firm from his father. Setting up a new firm may be costly because of entry barriers created by existing entrepreneurs.

Each agent therefore starts period t with a level of bequest (income) b_t^j, entrepreneurial talent $a_t^j \in \{A^H, A^L\}$, and $s_t^j \in \{0, 1\}$ which denotes whether the individual has inherited a firm. I will also refer to an agent with $s_t^j = 1$ as a member of the "elite", since he will have an advantage in becoming an entrepreneur (when there are entry barriers), and in an oligarchic society, he may be politically more influential than non-elite agents.

Within each period, each agent makes the following decisions: a consumption decision denoted by c_t^j, a bequest decision denoted by b_{t+1}^j, and an occupation choice $i_t^j \in \{0, 1\}$. In addition if $i_t^j = 1$, i.e., if the agent becomes an entrepreneur, he also makes investment (effort), employment, and hiding decisions, e_t^j, l_t^j and h_t^j, where h_t^j denotes whether he

[11] See, for example, Banerjee and Newman (1993) for a model of occupational choice of this type.

decides to hide his output in order to avoid taxation.

Agents also make the policy choices in this society. How the preferences of various agents map into policies differs depending on the political regime, which is discussed in detail below. For now I note that there are three policy choices: a tax rate $\tau_t \in [0,1]$ on output (the results are identical if τ_t is a tax on earned income, see footnote 21), lump-sum transfers to all agents denoted by $T_t \in [0,\infty)$, and a cost $K_t \in [0,\infty)$ to set up a new firm. I assume that the entry barrier K_t is pure waste, for example corresponding to the bureaucratic procedures that individuals have to go through to open a new business (see, e.g., De Soto, 1989, or Djankov et al., 2002). As a result, lump-sum transfers are financed only from taxes.[12]

An entrepreneur with talent a_t^j can produce the final good with the production function:

$$y_t^j = \frac{1}{1-\alpha}(a_t^j)^{\alpha}(e_t^j)^{1-\alpha}(l_t^j)^{\alpha}, \tag{3}$$

where l_t^j is the amount of labor hired by the entrepreneur and $e_t^j \geq 0$ is investment (or entrepreneurial effort). The cost of investment is non-pecuniary and equal to e_t^j. Furthermore, there is a maximum scale, λ, beyond which the firm cannot operate, so $l_t^j \in [0,\lambda]$. I also assume that the entrepreneur himself can work in his firm as one of the workers, which implies that the opportunity cost of becoming an entrepreneur is 0.[13]

Operating a firm requires a non-pecuniary flow cost, K' (this cost is incurred in every period of operation, as opposed to the cost K_t incurred for entry).[14] Therefore, the cost of effort is $z_t^j = 0$ for a worker and $z_t^j = e_t^j + K'$ or $z_t^j = e_t^j + K' + K_t$ for an entrepreneur depending on whether he has to pay the entry cost or not. To simplify the expressions below, I write $\kappa \equiv K'/\lambda$ and $k_t \equiv K_t/\lambda$.

Define

$$\pi_t^j = (1-\tau_t)\, y_t^j - w_t l_t^j - e_t^j - K'$$

as the return to entrepreneur j gross of the cost of entry barriers. Intuitively, the entrepreneur produces y_t^j, pays a fraction τ_t of this in taxes, pays a total wage bill of $w_t l_t^j$, and

[12] I assume that K_t is a non-pecuniary cost to simplify the discussion. Pecuniary entry barriers would lead to identical results because, in the relevant equilibrium, potential entrepreneurs will lack the funds to pay the upfront costs. Therefore, a pecuniary cost would also prevent entry like a non-pecuniary cost and raise no additional revenues.

[13] Throughout I assume that each entrepreneur has to run the firm himself, so it is his productivity, a_t^j, that matters for output. An alternative would be to allow costly delegation of managerial positions to other, more productive agents. In this case, low-productivity entrepreneurs may prefer to hire more productive managers. I discuss the implications of such a generalization in the conclusion.

[14] If $K' = 0$, then in the absence of entry barriers, the equilibrium distribution of firm size is indeterminate. $K' > 0$ avoids this complication.

incurs an investment and operation cost of $e_t^j + K'$. With some abuse of terminology, I will refer to π as the profit function. Given a tax rate τ_t and a wage rate $w_t \geq 0$, the net profits of an entrepreneur with talent a_t^j are:

$$\pi\left(\tau_t, l_t^j, e_t^j, a_t^j, w_t\right) = \frac{1-\tau_t}{1-\alpha}(a_t^j)^\alpha (e_t^j)^{1-\alpha}(l_t^j)^\alpha - w_t l_t^j - e_t^j - \kappa\lambda, \tag{4}$$

as long as the entrepreneur does not hide his output, i.e., $h_t^j = 0$. If he instead hides his output, i.e., $h_t^j = 1$, he avoids the tax, but loses a fraction $\delta < 1$ of his revenues, so his profits are:

$$\tilde{\pi}\left(\tau_t, l_t^j, e_t^j, a_t^j, w_t\right) = \frac{1-\delta}{1-\alpha}(a_t^j)^\alpha (e_t^j)^{1-\alpha}(l_t^j)^\alpha - w_t l_t^j - e_t^j - \kappa\lambda.$$

The comparison of these two expressions immediately implies that if $\tau_t > \delta$, all entrepreneurs will hide their output, and there will be no tax revenue. Therefore, the relevant range of taxes will be

$$0 \leq \tau_t \leq \delta.$$

Since, in the presence of entry barriers, entrepreneurship (i.e., $i_t^j = 1$) entails an additional cost K_t for agents with $s_t^j = 0$, the net gain to becoming an entrepreneur for an agent of type $\left(s_t^j, a_t^j\right)$ as a function of the policy vector (k_t, τ_t), and the wage rate, w_t, is:

$$\Pi\left(k_t, \tau_t, w_t \mid s_t^j, a_t^j\right) = \max_{l_t^j, e_t^j} \pi\left(\tau_t, l_t^j, e_t^j, a_t^j, w_t\right) - (1 - s_t^j)k_t\lambda \tag{5}$$

where the last term indicates that if the agent does not inherit the firm from his father, he will have to pay the additional cost imposed by entry barriers.[15] Notice also that Π is the *net gain* to becoming an entrepreneur, since the agent receives the wage rate w_t irrespective (either working for another entrepreneur when he is a worker, or working for himself—thus having to hire one less worker—when he is an entrepreneur). This feature implies that an agent will become an entrepreneur if $\Pi\left(k_t, \tau_t, w_t \mid s_t^j, a_t^j\right) > 0$ (and can become an entrepreneur only if $\Pi\left(k_t, \tau_t, w_t \mid s_t^j, a_t^j\right) \geq 0$).

[15] Private sales of firms from agents with $s_t^j = 1$ to those with $s_t^j = 0$ are not allowed (or they are equivalently assumed to be subject to the entry cost K_t). This is without loss of generality, since, as we will see below, entry barriers exist only in the oligarchic equilibrium, where the equilibrium wage is zero and agents with $s_t^j = 0$ do not have the funds to finance the purchase of existing firms from the incumbents.

Note that private sales of firms without any entry barrier-related costs would circumvent the inefficiencies from entry barriers. The absence of such sales, and consequently the existence of real effects of entry barriers, seems plausible in practice (see, for example, Djankov et al., 2002, on the relationship between entry barriers and various economic outcomes).

Labor market clearing requires the total demand for labor not to exceed the supply. Since entrepreneurs also work as workers, the supply is equal to 1, so:

$$\int_0^1 i_t^j l_t^j dj = \int_{j \in I_t} l_t^j dj \leq 1, \tag{6}$$

where I_t is the set of entrepreneurs at time t.

It is also useful at this point to specify the law of motion of the vector $\left(b_t^j, s_t^j, a_t^j\right)$ which determines the "type" of agent j at time t.[16] As already noted, bequests are given by equation (2). The transition rule for s_t^j is straightforward: if agent j at time t sets up a firm, then his offspring inherits a firm at time $t+1$, so

$$s_{t+1}^j = i_t^j, \tag{7}$$

with $s_0^j = 0$ for all j, and also $s_t^j = 0$ if dynasty j is born at time t. Finally, I assume that there is imperfect correlation between the entrepreneurial talents of different agents within a dynasty, and assume the following Markov structure:

$$a_{t+1}^j = \begin{cases} A^H & \text{with probability } \sigma_H & \text{if } a_t^j = A^H \\ A^H & \text{with probability } \sigma_L & \text{if } a_t^j = A^L \\ A^L & \text{with probability } 1-\sigma_H & \text{if } a_t^j = A^H \\ A^L & \text{with probability } 1-\sigma_L & \text{if } a_t^j = A^L \end{cases}, \tag{8}$$

where σ_H, $\sigma_L \in (0,1)$. Here σ_H is the probability that an agent has high productivity in entrepreneurship conditional on his father having high productivity, and σ_L is the probability when his father has low productivity. It is natural to suppose that $\sigma_H \geq \sigma_L$, so that an individual is more likely to be highly productive if his parent is so. What is important for the results is imperfect correlation of entrepreneurial talent within a dynasty, i.e., $\sigma_H < 1$, so that the identities of the entrepreneurs necessary to achieve productive efficiency change over time.

It can be verified easily that

$$M \equiv \frac{\sigma_L}{1-\sigma_H+\sigma_L} \in (0,1).$$

[16] In fact, what is important for the purposes here is the subvector $\left(s_t^j, a_t^j\right)$. Bequests are introduced to create a link between past profits and the incomes of current elites, which plays a role in Section 4. For most of the paper, there is no need to keep track of the distribution of bequests. It is also worth noting that the model could be set up with infinitely-lived agents, with little change in the results, though the analysis becomes somewhat more complicated, because agents would have to take into account the future implications of setting up a firm and becoming part of the elite. Since these issues are not central to the focus here, I opted for the non-overlapping generations setup.

is the fraction of agents with high productivity in the stationary distribution (i.e., $M(1-\sigma_H) = (1-M)\sigma_L$). Since there is a large number of agents, I appeal informally to the weak law of large numbers (ignoring complications related to the fact that there is a continuum of agents), which implies that the fraction of agents with high productivity at any point is M. Throughout I assume that

$$M\lambda > 1,$$

so that, without entry barriers, high-productivity entrepreneurs generate more than sufficient demand to employ the entire labor supply. Moreover, I think of M as small and λ as large; in particular, I assume $\lambda > 2$, which ensures that the workers are always in the majority and simplifies the political economy discussion below.

Finally, the timing of events within every period is:

1. Entrepreneurial talents, $[a_t^j]$, are realized.

2. The entry barrier for new entrepreneurs k_t is set.

3. Agents make occupational choices, $[i_t^j]$.

4. Entrepreneurs make investment and employment decisions, $[e_t^j, l_t^j]$.

5. The labor market clearing wage rate, w_t, is determined.

6. The tax rate on entrepreneurs, τ_t, is set.

7. Entrepreneurs make hiding decisions, $[h_t^j]$.

8. Consumption and bequest decisions, $[c_t^j, b_{t+1}^j]$ are made.

Note that I used the notation $[a_t^j]$ to describe the whole set $[a_t^j]_{j\in[0,1]}$, or more formally, the mapping $\mathbf{a}_t : [0,1] \to \{A^L, A^H\}$, which assigns a productivity level to each individual j, and similarly for $[i_t^j]$, etc.

Entry barriers and taxes will be set by different agents in different political regimes as will be specified below. Notice that taxes are set after the investment decisions, which can be motivated by potential commitment problems whereby entrepreneurs can be "held up" after they make their investments decision. Once these investments are sunk and employment decisions are made, it is in the interest of the workers to tax and redistribute entrepreneurial income.[17]

[17] This timing of events is adopted to simplify the analysis and the exposition. Because there are only

2.2 Analysis

I start with the "economic equilibrium" which is the (subgame perfect) equilibrium of the economy described above given a policy sequence $\{k_t, \tau_t\}_{t=0,1,...}$. To define this equilibrium more formally, let $x_t^j = \left(i_t^j, e_t^j, l_t^j, h_t^j, c_t^j, b_{t+1}^j\right)$ be the vector of choices of agent j at time t.

Definition (Economic Equilibrium) $\left\{\left[\hat{x}_t^j\right]\right\}_{t=0,1,...}$ and a sequence of wage rates $\{\hat{w}_t\}_{t=0,1,...}$ constitute an economic equilibrium if, given policies k_t, τ_t, the wage rate $\hat{w}_t$ and his type $\left(b_t^j, s_t^j, a_t^j\right)$, x_t^j maximizes the utility of agent j, (1), and $\hat{w}_t$ clears the labor market, i.e., equation (6) holds. Each agent's type in the next period, $\left(b_{t+1}^j, s_{t+1}^j, a_{t+1}^j\right)$, then follows from equations (2), (7) and (8) given $\left[x_t^j\right]$.

I now characterize this equilibrium. Recall that $s_0^j = 0$ for all j, and suppose $k_0 = 0$, so that in the initial period there are no entry barriers (since $s_0^j = 0$ for all j, any positive entry barrier would create waste, but not affect who enters entrepreneurship).

The fixed costs of operation and the constant returns to scale technology imply that all entrepreneurs will hire the maximum amount of labor. Thus, for all $j \in I_t$,

$$l_t^j = \lambda, \tag{9}$$

where, recall that, I_t is the set of entrepreneurs at time t. Given this, investments will be:

$$e_t^j = (1-\tau_t)^{1/\alpha} a_t^j \lambda. \tag{10}$$

(Alternatively, (10) can be written as $e_t^j = (1-\hat{\tau}_t)^{1/\alpha} a_t^j \lambda$ where $\hat{\tau}_t$ is the tax rate expected at the time of investment; in equilibrium, $\hat{\tau}_t = \tau_t$).

Now using the equilibrium factor demands, (9) and (10), the net gain to entrepreneurship, as a function of entry barriers, taxes, equilibrium wages, the status s_t^j of the agent and entrepreneurial talent, can be obtained as:

$$\Pi\left(k_t, , \tau_t, w_t \mid s_t^j, a_t^j\right) = \frac{\alpha}{1-\alpha}(1-\tau_t)^{1/\alpha} a_t^j \lambda - w_t \lambda - \kappa\lambda - (1-s_t^j) k_t \lambda. \tag{11}$$

two types of entrepreneurs, it turns out that if workers choose the tax rate before investment decisions, they will set $\tau_t = 0$ (see Appendix A). The timing of events here implies that they cannot commit to this tax rate, and consequently ensures a positive level of redistribution. In Appendix A, I show that the main results generalize to an environment where there are more than two levels of entrepreneurial productivity and where voters set taxes τ_t at the same time as k_t, i.e., before investment decisions. In this case, voters choose $\tau_t > 0$, trading off redistribution and the disincentive effects of taxation, as in, among others, the models by Romer (1975), Roberts (1977), and Meltzer and Richard (1981).

Moreover, since $l_t^j = \lambda$ for all j, the labor market clearing condition (6) implies that $\int_{j \in I_t} \lambda dj = 1$, and the total mass of entrepreneurs at any time is:

$$\mathbf{i}_t \equiv \int_{j \in I_t} dj \leq 1/\lambda.$$

Tax revenues at time t and the per capita lump-sum transfers are given as:

$$T_t = \sum_{j \in I_t} \tau_t y_t^j = \frac{1}{1-\alpha} \tau_t (1-\tau_t)^{\frac{1-\alpha}{\alpha}} \lambda \sum_{j \in I_t} a_t^j. \tag{12}$$

Who will become an entrepreneur in this economy? Inspection of (11) immediately shows that $\Pi\left(k_t, \tau_t, w_t \mid s_t^j = 1, a_t^j = A^H\right) \geq \Pi\left(k_t, \tau_t, w_t \mid \tilde{s}_t^j, \tilde{a}_t^j\right) \geq \Pi\left(k_t, \tau_t, w_t \mid s_t^j = 0, a_t^j = A^L\right)$ for any $\tilde{s}_t^j$ and $\tilde{a}_t^j$, and the first term is always strictly greater than the third term. So agents with $a_t^j = A^L$ and $s_t^j = 0$ will choose $i_t^j = 0$, becoming workers. On the other hand, the occupational choice of agents with $a_t^j = A^L$ and $s_t^j = 1$ and of those with $a_t^j = A^H$ and $s_t^j = 0$ will depend on k_t.

We can then define two different types of equilibria:

1. *Entry equilibrium* where all entrepreneurs have $a_t^j = A^H$.

2. *Sclerotic equilibrium* where agents with $s_t^j = 1$ become entrepreneurs irrespective of their productivity.

An entry equilibrium requires that $\Pi\left(k_t, \tau_t, w_t \mid s_t^j = 0, a_t^j = A^H\right) \geq 0$ and $\Pi\left(k_t, \tau_t, w_t \mid s_t^j = 1, a_t^j = A^L\right) \leq 0$, that is:

$$\frac{\alpha}{1-\alpha}(1-\tau_t)^{1/\alpha} A^H - \kappa - k_t \geq w_t \geq \frac{\alpha}{1-\alpha}(1-\tau_t)^{1/\alpha} A^L - \kappa.$$

Therefore, there will be an entry equilibrium only if

$$\frac{\alpha}{1-\alpha}(1-\tau_t)^{1/\alpha}\left(A^H - A^L\right) \geq k_t, \tag{13}$$

i.e., only if the net marginal product of labor of a high-productivity non-elite entrepreneur is greater than that of a low-productivity elite. A sclerotic equilibrium will emerge, on the other hand, only if the converse of (13) is the case.

Moreover, in an entry equilibrium, i.e., when (13) holds, we have

$$w_t^e = \max\left\{\frac{\alpha}{1-\alpha}(1-\tau_t)^{1/\alpha} A^H - \kappa - k_t; 0\right\}. \tag{14}$$

This follows because, in equilibrium, $\Pi\left(k_t, \tau_t, w_t \mid s_t^j = 0, a_t^j = A^H\right)$ must be equal to zero. If it were strictly positive, or in other words, if the wage were less than w_t^e, all agents with high productivity would enter entrepreneurship, and since, by assumption, $M\lambda > 1$ there would be "excess demand" for labor. This argument also shows that $\mathbf{i}_t = 1/\lambda$.

Figure 2 illustrates the entry equilibrium diagrammatically by plotting labor demand and supply in this economy. Labor supply is constant at 1, while labor demand is decreasing as a function of the wage rate. This figure is drawn under the assumption that (13) holds, so that there exists an entry equilibrium. The first portion of the curve shows the demand of high-productivity elites, i.e., agents with $a_t^j = A^H$ and $s_t^j = 1$, and the second portion is for high-productivity non-elites, i.e., those with $a_t^j = A^H$ and $s_t^j = 0$. These two groups together demand $M\lambda > 1$ workers, ensuring that labor demand intersects labor supply at the wage given in (14).

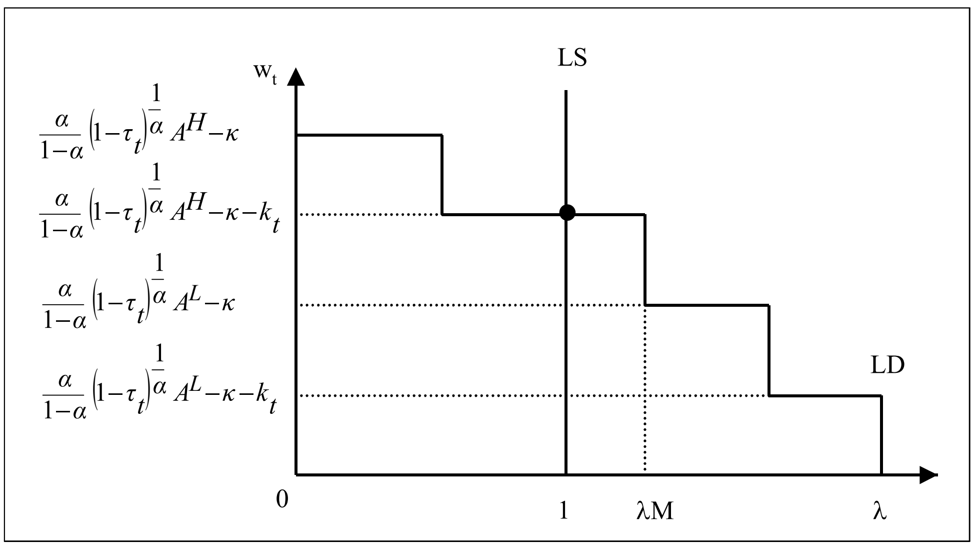

Figure 2: Labor supply and labor demand when (13) holds and there exists an entry equilibrium.

In a sclerotic equilibrium, on the other hand, low-productivity agents who inherited a firm from their parents will remain in entrepreneurship, i.e., $s_t^j = s_{t-1}^j$. If there were no deaths so that $\varepsilon = 0$, we would have $\mathbf{i}_t = 1/\lambda$ and for any $w_t \in \left[\max\left\{\frac{\alpha}{1-\alpha}(1-\tau_t)^{1/\alpha}A^H - \kappa - k_t; 0\right\}, \frac{\alpha}{1-\alpha}(1-\tau_t)^{1/\alpha}A^L - \kappa\right]$, labor demand would exactly equal labor supply—$1/\lambda$ agents demanding exactly λ workers each, and a total supply of 1. Hence, there would be multiple equilibrium wages. In contrast, when $\varepsilon > 0$, the measure of entrepreneurs who could pay a wage of $\frac{\alpha}{1-\alpha}(1-\tau_t)^{1/\alpha}A^L - \kappa$ is $\mathbf{i}_t =$

$(1-\varepsilon)\,\mathbf{i}_{t-1} < 1/\lambda$ for all $t > 0$, thus there would be excess supply of labor at this wage, or at any wage above the lower support of the above range. This implies that the equilibrium wage would be equal to this lower support, $\max\left\{\frac{\alpha}{1-\alpha}(1-\tau_t)^{1/\alpha}A^H - \kappa - k_t; 0\right\}$, which is identical to (14). Since at this wage agents with $a_t^j = A^H$ and $s_t^j = 0$ are indifferent between entrepreneurship and working, in equilibrium a sufficient number of them enter entrepreneurship, and $\mathbf{i}_t = 1/\lambda$. In the remainder, I focus on the limiting case of this economy where $\varepsilon \to 0$, which picks $\max\left\{\frac{\alpha}{1-\alpha}(1-\tau_t)^{1/\alpha}A^H - \kappa - k_t; 0\right\}$ as the equilibrium wage even when labor supply coincides with labor demand for a range of wages.[18]

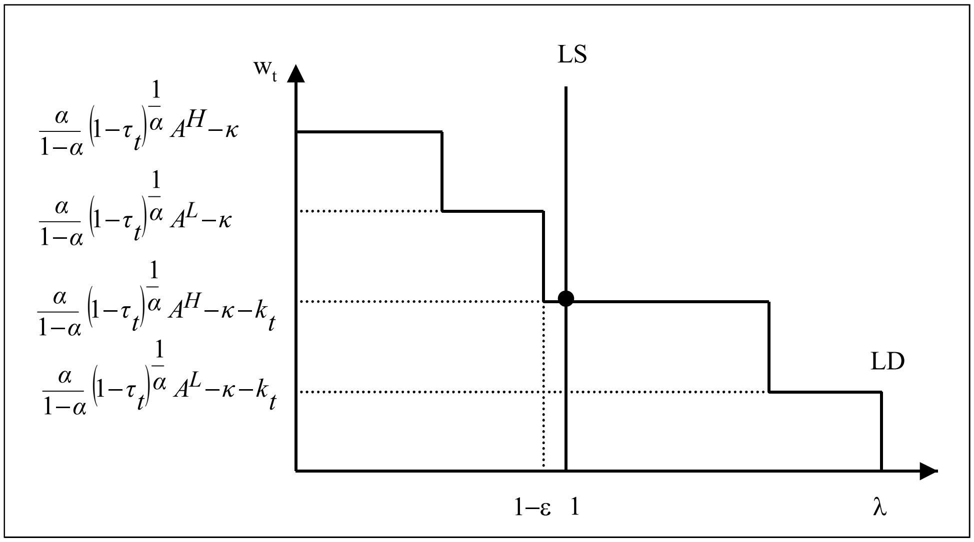

Figure 3: Labor supply and labor demand when (13) does not hold and there exists a sclerotic equilibrium.

Figure 3 illustrates this case diagrammatically. Because (13) does not hold in this case, the second flat portion of the labor demand curve is for low-productivity elites, i.e., agents with $a_t^j = A^L$ and $s_t^j = 1$, who, given the entry barriers, have a higher marginal product of labor than high-productivity non-elites.

Finally, since at time $t = 0$ we have $k_0 = 0$, the initial period equilibrium will feature:

$$w_0 = \max\left\{\frac{\alpha}{1-\alpha}(1-\tau_0)^{1/\alpha}A^H - \kappa; 0\right\}.$$

[18] In other words, the wage $\max\left\{\frac{\alpha}{1-\alpha}(1-\tau_t)^{1/\alpha}A^H - \kappa - k_t; 0\right\}$ at $\varepsilon = 0$ is the only point in the equilibrium set where the equilibrium correspondence is (lower-hemi) continuous in ε. For completeness, I will also give the relevant expressions for the case where $\varepsilon > 0$.

In the remainder of the paper, I assume

$$\frac{\alpha}{1-\alpha}(1-\delta)^{1/\alpha}A^H > \kappa, \tag{15}$$

so that, for any tax $\tau \leq \delta$ and $k = 0$, the equilibrium wage is positive.

In addition, note that at $t = 0$, all entrepreneurs have high productivity. More specifically, define

$$\mu_t = \Pr\left(a_t^j = A^H \mid i_t^j = 1\right) = \Pr\left(a_t^j = A^H \mid j \in I_t\right)$$

as the fraction of entrepreneurs at time t who are high productivity. In the initial period, the economy starts with $\mu_0 = 1$. The law of motion of μ_t is then given by:[19]

$$\mu_t = \begin{cases} \sigma_H \mu_{t-1} + \sigma_L(1-\mu_{t-1}) & \text{if (13) does not hold} \\ 1 & \text{if (13) holds} \end{cases}. \tag{16}$$

This law of motion also implies that if (13) never holds, $\lim_{t\to\infty} \mu_t = M < 1$, i.e., the fraction of high-productivity entrepreneurs limits to the average fraction of high-productivity agents in the population.

The following proposition summarizes the main results in this subsection (proof in the text):

Proposition 1 Given a policy sequence $\{k_t, \tau_t\}_{t=0,1,\ldots}$, an equilibrium always exists. In equilibrium, there are $\mathbf{i}_t = 1/\lambda$ entrepreneurs and each entrepreneur hires λ workers, and undertakes the investment level given by (10), and the equilibrium wage is given by (14). In addition:

- if (13) holds at t, an individual becomes an entrepreneur only if he has high productivity, i.e., $i_t^j = 1 \Rightarrow a_t^j = A^H$, and the fraction of high-productivity entrepreneurs is $\mu_t = 1$;
- if (13) does not hold at t, the equilibrium has $i_t^j = s_t^j$, and the fraction of high-productivity entrepreneurs is $\mu_t = \sigma_H \mu_{t-1} + \sigma_L(1-\mu_{t-1})$;
- if (13) never holds, then the equilibrium has $\mu_t = \sigma_H \mu_{t-1} + \sigma_L(1-\mu_{t-1})$ starting with $\mu_0 = 1$, and satisfies $\lim_{t\to\infty} \mu_t = M < 1$.

[19] For $\varepsilon > 0$, this equation is modified to:

$$\mu_t = \begin{cases} \varepsilon + (1-\varepsilon)\left(\sigma_H \mu_{t-1} + \sigma_L(1-\mu_{t-1})\right) & \text{if (13) does not hold} \\ 1 & \text{if (13) holds} \end{cases}$$

3 Political Equilibrium

To obtain a full political equilibrium, we need to determine the policy sequence $\{k_t, \tau_t\}_{t=0,1,...}$. I will consider two extreme cases:

1. Democracy: the policies k_t and τ_t are determined by majoritarian voting, with each agent having one vote.

2. Oligarchy (elite control): the policies k_t and τ_t are determined by majoritarian voting among the elite at time t. I take the elite to be those who have inherited a firm from their parents, or in other words those with $s_t = 1$.

In this section, oligarchy is assumed to be "technological" in the sense that irrespective of the exact political institutions, those with control of the productive resources of the society and greater income have more say in political decision-making, and consequently, policy choices reflect their preferences. In the next section, I analyze a model where whether the society is democratic or oligarchic is determined in equilibrium.

3.1 Democracy

The timing of events implies that the tax rate at time t, τ_t, is decided after investment decisions at time t, whereas the entry barriers are decided before. Both of these policy decisions are made by majoritarian voting.[20] Recall also that the assumption $\lambda > 2$ above ensures that non-elite agents are always in the majority.

At the time taxes are set, investments are sunk, agents have already made their occupation choices, and workers are in the majority. Therefore, taxes will be chosen to maximize per capita transfers. We can use equation (12) to write tax revenues as:

$$T_t(k_t, \tau_t \mid \hat{\tau}_t) = \begin{cases} \frac{1}{1-\alpha}\tau_t(1-\hat{\tau}_t)^{\frac{1-\alpha}{\alpha}}\lambda \sum_{j\in I_t} a_t^j & \text{if } \tau_t \leq \delta \\ 0 & \text{if } \tau_t > \delta \end{cases}, \tag{17}$$

where $\hat{\tau}_t$ is the tax rate expected by entrepreneurs and τ_t is the actual tax rate set by voters. This expression takes into account that if $\tau_t > \delta$, entrepreneurs will hide their output, and tax revenue will be 0. T_t is a function of the entry barrier, k_t, since this can affect the selection of entrepreneurs, and thus the $\sum_{j\in I_t} a_t^j$ term.

At the time the entry barrier, k_t, is set, agents have not made their occupational choices. Low-productivity non-elite agents, i.e., those with $s_t^j = 0$ and $a_t^j = A^L$, know that

[20] Appendix A presents a more general version of the model, which has both policy choices made simultaneously, and yields identical results to those in the text.

they will always be workers, and thus simply receive the equilibrium wage and transfers. Therefore, the utility of agent j with $s_t^j = 0$ and $a_t^j = A^L$ is

$$\hat{U}_t^j = b_t^j + w_t^e (k_t \mid \hat{\tau}_t) + T_t (k_t, \tau_t \mid \hat{\tau}_t), \tag{18}$$

where b_t^j is the bequests he has inherited, and $w_t^e (k_t \mid \hat{\tau}_t)$ is the equilibrium wage given by equation (14), but with the anticipated tax rate $\hat{\tau}_t$ replacing the actual tax rate (this is because the labor market clears before tax decisions, so w_t^e is conditioned on the expected tax rate, $\hat{\tau}_t$; in equilibrium, naturally, $\tau_t = \hat{\tau}_t$). Thus:

$$w_t^e (k_t \mid \hat{\tau}_t) = \max \left\{ \frac{\alpha}{1-\alpha} (1-\hat{\tau}_t)^{1/\alpha} A^H - \kappa - k_t ; 0 \right\}. \tag{19}$$

High-productivity non-elite agents, i.e., those with $s_t^j = 0$ and $a_t^j = A^H$, may become entrepreneurs, but as the above analysis shows, in this case, $\Pi \left(k_t, \tau_t, w_t \mid s_t^j = 0, a_t^j = A^H \right) = 0$, so their utility is also given by (18). Consequently, all non-elite agents will choose k_t to maximize $w_t^e (k_t \mid \hat{\tau}_t) + T_t (k_t, \tau_t \mid \hat{\tau}_t)$. Since the preferences of all non-elite agents are the same and they are in the majority, the democratic equilibrium will maximize these preferences. This analysis shows that a democratic equilibrium can be defined as:

Definition (Democratic Equilibrium) A democratic equilibrium is a policy sequence $\left\{ \hat{k}_t, \hat{\tau}_t \right\}_{t=0,1,\ldots}$ and economic decisions $\left\{ \left[\hat{x}_t^j \right] \right\}_{t=0,1,\ldots}$ such that $\left\{ \left[\hat{x}_t^j \right] \right\}_{t=0,1,\ldots}$ is an economic equilibrium given $\left\{ \hat{k}_t, \hat{\tau}_t \right\}_{t=0,1,\ldots}$ and $\left\{ \hat{k}_t, \hat{\tau}_t \right\}_{t=0,1,\ldots}$ is such that:

$$\left(\hat{k}_t, \hat{\tau}_t \right) \in \arg\max_{k_t, \tau_t} w_t^e (k_t \mid \hat{\tau}_t) + T_t (k_t, \tau_t \mid \hat{\tau}_t).$$

Because taxes are set after investment decisions, workers prefer $\tau_t = \delta$ to maximize the redistribution of income from the entrepreneurs to themselves—$T_t (k_t, \tau_t \mid \hat{\tau}_t)$ is maximized at $\tau_t = \delta$ and $w_t^e (k_t \mid \hat{\tau}_t)$ does not depend on τ_t.[21]

[21] The results are identical when taxes are on income rather than output. In this case, the objective function of the median voter would be: $(1-\tau_t) w_t^e (k_t \mid \hat{\tau}_t) + T_t (k_t, \tau_t \mid \hat{\tau}_t)$, with $T_t (k_t, \tau_t \mid \hat{\tau}_t)$ unchanged (this is because tax revenues now include taxes from wage income, but this is offset by the lower tax revenue from entrepreneurs, who are now paying taxes only on their net income, i.e., output minus wage bill). It can be verified that this expression is still maximized at $\tau_t = \delta$. To see this note that the derivative of this expression with respect to τ_t is

$$\frac{1}{1-\alpha} (1-\hat{\tau}_t)^{\frac{1-\alpha}{\alpha}} \lambda \sum_{j \in I_t} a_t^j - w_t^e (k_t \mid \hat{\tau}_t),$$

which is always positive since, by definition, for all $j \in I_t$, we have $\frac{\alpha}{1-\alpha} (1-\hat{\tau}_t)^{\frac{1-\alpha}{\alpha}} \lambda a_t^j - w_t^e \geq 0$. Therefore, $\frac{1}{1-\alpha} (1-\hat{\tau}_t)^{\frac{1-\alpha}{\alpha}} \lambda a_t^j > w_t^e$, implying that voters would like as high a tax rate as possible, i.e., $\tau_t = \delta$.

Inspection of (17) and (19) shows that wages and tax revenue are both maximized when $k_t = 0$, so the democratic equilibrium will not impose any entry barriers. This is intuitive: workers have nothing to gain by protecting incumbents, and a lot to lose, since such protection reduces labor demand and wages. Since there are no entry barriers, only high-productivity agents will become entrepreneurs, or in other words $i_t^j = 1$ only if $a_t^j = A^H$. The following proposition therefore follows immediately (proof in the text):

Proposition 2 A democratic equilibrium always features $\tau_t = \delta$ and $k_t = 0$, and $i_t^j = 1$ if and only if $a_t^j = A^H$, and $\mu_t = 1$. The equilibrium wage rate is given by

$$w_t^D = \frac{\alpha}{1-\alpha}(1-\delta)^{1/\alpha} A^H - \kappa,$$

and the aggregate output is

$$\begin{aligned} Y_t^D = Y^D &\equiv \frac{1}{1-\alpha}(1-\delta)^{1/\alpha} A^H + \delta \frac{(1-\delta)^{\frac{1-\alpha}{\alpha}}}{1-\alpha} A^H, \\ &\equiv \frac{1}{1-\alpha}(1-\delta)^{\frac{1-\alpha}{\alpha}} A^H. \end{aligned} \tag{20}$$

Notice that in the first line of (20), the first term is total production net of taxes, and the second term is tax revenue at the rate $\tau_t = \delta$.[22] An important feature of this equilibrium is that aggregate output is constant over time, which will contrast with the oligarchic equilibrium.

Finally, note that since

$$\Pi\left(k_t = 0, \tau_t, w_t \mid s_t^j = 0, a_t^j = A^H\right) = \Pi\left(k_t = 0, \tau_t, w_t \mid s_t^j = 1, a_t^j = A^H\right) = 0,$$

high-productivity agents are indifferent between entrepreneurship and production work. Nevertheless, entrepreneurs earn greater incomes to compensate them for the non-pecuniary costs of entrepreneurship. In fact, in all periods, production workers have a post-tax income (net of bequests):[23]

$$W^w = \frac{\alpha}{1-\alpha}(1-\delta)^{1/\alpha} A^H - \kappa + \delta \frac{(1-\delta)^{\frac{1-\alpha}{\alpha}}}{1-\alpha} A^H, \tag{21}$$

[22] The expression above refers to total output, before the costs of investment, e, and operation, κ, have been subtracted. Output net of these costs is given by $\alpha(1-\delta)^{1/\alpha} A^H / (1-\alpha) + \alpha\delta(1-\delta)^{(1-\alpha)/\alpha} A^H / (1-\alpha) - \kappa$.

[23] To obtain (21), use the expression for the equilibrium wage, (19) and tax revenues, (17), with $\tau = \hat{\tau} = \delta$. To obtain (22), use the production function (3) with equilibrium factor demands (9) and (10), and the fact that output is taxed at the rate $\tau = \hat{\tau} = \delta$, then subtract the total wage bill using (19), and add W^w, which is what the entrepreneur receives as a worker himself.

while each entrepreneur receives:

$$W^e = (1-\delta)^{1/\alpha} A^H \lambda + \kappa\lambda + W^w > W^w. \tag{22}$$

3.2 Oligarchy

In oligarchy, only existing entrepreneurs (agents with $s_t^j = 1$) participate in the political process, and policies are determined by majoritarian voting among this set of agents. The nature of the oligarchic equilibrium is simplified by the fact that the only heterogeneity within the elite is between high-productivity and low-productivity agents. This implies that majoritarian voting will lead to the policies most preferred by whichever group is in the majority *within* the elite.

To state this formally, let $\bar{\mu}_t$ be the fraction of high-productivity agents among those with $s_t = 1$. This is different from μ_t, which refers to the entrepreneurs, i.e., those with $i_t = 1$, whereas $\bar{\mu}_t$ refers to the agents in the elite, i.e., those with $s_t = 1$. Notice that if an agent $s_t = 1$ chooses $i_t = 0$ and does not become an entrepreneur, he is still in the elite at time t, and thus takes part in the determination of the tax rate, though his offspring will not be in the elite.[24]

In addition, note that the most preferred policies of an elite agent with productivity a_t^j are given by k_t and τ_t that maximize:

$$U_t^j = b_t^j + \max\left\{\Pi\left(k_t, \tau_t, w_t \mid s_t^j = 1, a_t^j\right); 0\right\} + w_t^e\left(k_t \mid \hat{\tau}_t\right) + T_t\left(k_t, \tau_t \mid \hat{\tau}_t\right),$$

where b_t^j is the bequest the agent has inherited, the Π function, from (5) above, denotes the net return to entrepreneurship, w_t^e, given by (19), is the equilibrium wage rate and T_t, given by (17), denotes transfers. This expression incorporates the fact that the agent will become an entrepreneur only if the net return to entrepreneurship is non-negative.

Then let us define:

Definition (Oligarchic Equilibrium) An oligarchic equilibrium is a policy sequence $\left\{\hat{k}_t, \hat{\tau}_t\right\}_{t=0,1,...}$ and economic decisions $\left\{\left[\hat{x}_t^j\right]\right\}_{t=0,1,...}$ such that $\left\{\left[\hat{x}_t^j\right]\right\}_{t=0,1,...}$ is an economic equilibrium given $\left\{\hat{k}_t, \hat{\tau}_t\right\}_{t=0,1,...}$ and $\left\{\hat{k}_t, \hat{\tau}_t\right\}_{t=0,1,...}$ is such that:

[24] An alternative modeling assumption would be to limit the decision on the tax rate only to agents with $i_t = 1$. It can be verified that the equilibrium in this case is identical to the non-cycling equilibrium characterized here (i.e., it does not contain cycles even when condition (24) holds).

* if $\bar{\mu}_t \geq 1/2$, then

$$\left(\hat{k}_t, \hat{\tau}_t\right) \in \arg\max_{k_t,\tau_t} \left\{\max\left\langle \Pi\left(k_t, \tau_t, w_t \mid s_t^j = 1, a_t^j = A^H\right); 0\right\rangle + w_t^e\left(k_t \mid \hat{\tau}_t\right) + T_t\left(k_t, \tau_t \mid \hat{\tau}_t\right)\right\};$$

* if $\bar{\mu}_t < 1/2$, then

$$\left(\hat{k}_t, \hat{\tau}_t\right) \in \arg\max_{k_t,\tau_t} \left\{\max\left\langle \Pi\left(k_t, \tau_t, w_t \mid s_t^j = 1, a_t^j = A^L\right); 0\right\rangle + w_t^e\left(k_t \mid \hat{\tau}_t\right) + T_t\left(k_t, \tau_t \mid \hat{\tau}_t\right)\right\},$$

where $T_t\left(k_t, \tau_t \mid \hat{\tau}_t\right)$ is given by (17) and $w_t^e\left(k_t \mid \hat{\tau}_t\right)$ is given by (19).

To characterize the oligarchic equilibrium, let us first consider the preferences of high-productivity elites (i.e., those with $s_t^j = 1$ and $a_t^j = A^H$). Since these agents will remain as an entrepreneur, they would always like the wage and taxes to be as low as possible, i.e., $\hat{\tau}_t = 0$. Equilibrium wage, given in (19), will be minimized at $w_t^e = 0$, by choosing any $k_t \in \left[\frac{\alpha}{1-\alpha}(1-\hat{\tau}_t)^{1/\alpha} A^H - \kappa, \infty\right)$. Without loss of any generality, I focus on a particular point in this set,

$$\hat{k}_t = k^E \equiv \frac{\alpha}{1-\alpha}(1-\delta)^{1/\alpha} A^H - \kappa. \tag{23}$$

Next consider the policy preference of a low-productivity elite (i.e., an agent with $s_t^j = 1$ and $a_t^j = A^L$). His payoff is maximized either by $k_t = k^E$ and $\tau_t = 0$, when he remains an entrepreneur, making profits equal to $\left(\frac{\alpha}{1-\alpha}A^L - \kappa\right)\lambda$ (plus 0 wage and 0 redistribution). Or it is maximized by $k_t = 0$ and $\tau_t = \delta$, when he chooses to become a worker receiving income $\frac{\alpha}{1-\alpha}(1-\delta)^{1/\alpha}A^H - \kappa + \frac{\delta}{1-\alpha}(1-\delta)^{(1-\alpha)/\alpha}A^H$. As long as

$$\lambda > \frac{\frac{1}{1-\alpha}\left[\alpha(1-\delta)^{1/\alpha} + \delta(1-\delta)^{(1-\alpha)/\alpha}\right]A^H - \kappa}{\frac{\alpha}{1-\alpha}A^L - \kappa}, \tag{24}$$

profits from entrepreneurship are greater, and low-productivity elites prefer the first option.[25] Therefore, when (24) holds, both low-productivity and high-productivity elites have the same preferences over policies, and vote for $k_t = k^E$ and $\tau_t = 0$. This combination is the oligarchic equilibrium, and results in equilibrium wages $w_t^e = 0$.[26]

In this equilibrium, aggregate output is:

$$Y_t^E = \mu_t \frac{1}{1-\alpha}A^H + (1-\mu_t)\frac{1}{1-\alpha}A^L \tag{25}$$

[25] Note that if the policy of $k_t = k^E$ and $\tau_t = 0$ is imposed, the low-productivity elite would always prefer to remain in entrepreneurship. However, when deciding policies, the choice is between entrepreneurship with $k_t = k^E$ and $\tau_t = 0$, and production work with $k_t = 0$ and $\tau_t = \delta$.

[26] This result also shows that even if taxes that only apply to labor income and transfers directed only to the elite were allowed, there would be no need for the elite to use them, since wages are already at their minimum value.

where $\mu_t = \sigma_H \mu_{t-1} + \sigma_L(1-\mu_{t-1})$ as given by (16), with $\mu_0 = 1$. Since μ_t is a decreasing sequence converging to M, aggregate output Y_t^E is also decreasing over time with:[27]

$$\lim_{t\to\infty} Y_t^E = Y_\infty^E \equiv \frac{1}{1-\alpha}\left(A^L + M(A^H - A^L)\right). \tag{26}$$

The reason for this is that as time goes by, the comparative advantage of the members of the elite in entrepreneurship gradually disappears because of the imperfect correlation between parents' and children's talents.

Another important feature of this equilibrium is that there is a high degree of (earnings) inequality. Wages are equal to 0, while entrepreneurs earn positive profits—in fact, each entrepreneur earns λY_t^E, and their total earnings equal aggregate output. This contrasts with relative equality in democracy.

Alternately, when (24) does not hold, low-productivity elites have different policy preferences from high-productivity elites. Therefore, the equilibrium depends on the ratio of high-productivity vs. low-productivity elites, i.e., on $\bar{\mu}_t$. When $\bar{\mu}_t \geq 1/2$, high-productivity elites are pivotal and the above characterization applies—i.e., $\hat{k}_t = k^E$ and $\hat{\tau}_t = 0$. In contrast, when $\bar{\mu}_t < 1/2$, low-productivity elites are in the majority and equilibrium policies are $\hat{k}_t = 0$ and $\hat{\tau}_t = \delta$. Therefore, at date t, the equilibrium will be identical to the democratic equilibrium. However, entry of high-productivity agents into entrepreneurship when $\hat{k}_t = 0$ implies that $\mu_t = 1$. Then provided that $\sigma_H > 1/2$, $\bar{\mu}_{t+1}$ will be greater than 1/2 and high-productivity elites will be in the majority again at time $t+1$, and the equilibrium will revert back to the sclerotic one with entry barriers k^E and 0 taxes. Therefore, when (24) does not hold, the equilibrium will be cyclic with periodicity $\hat{t}$ satisfying $\hat{t} = \min t \in \mathbb{N} : \bar{\mu}_t < 1/2$. Alternatively, using the fact that $\bar{\mu}_t = \mu_t$ for all $t < \hat{t}$, $\hat{t}$ can be defined as $\hat{t} = \min t \in \mathbb{N} : \mu_{t-1} < \frac{1/2-\sigma_L}{\sigma_H - \sigma_L}$.[28] If, on the other hand, $\sigma_H \leq 1/2$, then even at $t+1$ low-productivity agents will be the majority within the elite, and will prefer $k_t = 0$ and $\tau_t = \delta$, so the oligarchic equilibrium will be identical to the democratic one.

Therefore, we have the following proposition (proof in the text):

Proposition 3 If (24) holds, then the oligarchic equilibrium has $\tau_t = 0$ and $k_t = k^E$ as given by (23), and the equilibrium is always sclerotic and features $w_t^e = 0$. Aggre-

[27] For the case where $\varepsilon > 0$, we have $\mu_t = \varepsilon + (1-\varepsilon)\left(\sigma_H \mu_{t-1} + \sigma_L(1-\mu_{t-1})\right)$ and $Y_t^E = \mu_t \frac{1}{1-\alpha} A^H + (1-\mu_t)\frac{1}{1-\alpha}A^L$ and $Y_\infty^E \equiv \frac{1}{1-\alpha}\left(A^L + \frac{\varepsilon+(1-\varepsilon)\sigma_L}{1-(1-\varepsilon)(\sigma_H-\sigma_L)}(A^H - A^L)\right)$.

[28] In other words, this is the level of μ_{t-1} such that were the equilibrium to remain sclerotic, μ_t would be less than 1/2 for the first time at $t = \hat{t}$. But because the equilibrium switches to the entry equilibrium, we have $\mu_{\hat{t}} = 1$ while $\bar{\mu}_{\hat{t}} < 1/2$.

gate output is given by (25) and decreases over time starting at $Y_0^E = \frac{1}{1-\alpha}A^H$ with $\lim_{t\to\infty} Y_t^E = Y_\infty^E$ as given by (26).

If (24) does not hold and $\sigma_H > 1/2$, then the oligarchic equilibrium is cyclic. The economy starts with $\mu_0 = 1$, and μ_t satisfies the law of motion $\mu_t = \sigma_H \mu_{t-1} + \sigma_L(1-\mu_{t-1})$ until $t = \hat{t}$ where $\hat{t}$ is defined as $\hat{t} = \min t \in \mathbb{N} : \mu_{t-1} < \frac{1/2-\sigma_L}{\sigma_H-\sigma_L}$. The equilibrium has $\tau_t = 0$ and $k_t = k^E$ as given by (23) if $t \neq n\hat{t}$ for any $n \in \mathbb{N}$, and $\tau_t = \delta$ and $k_t = 0$ if $t = n\hat{t}$ for some $n \in \mathbb{N}$. Aggregate output is given by (25) with $\mu_t = \sigma_H \mu_{t-1} + \sigma_L(1-\mu_{t-1})$ if $t \neq n\hat{t}$ for any $n \in \mathbb{N}$, and $\mu_t = 1$ if $t = n\hat{t}$ for some $n \in \mathbb{N}$, so it declines during all periods where $t \neq n\hat{t}$, and jumps up to $\frac{1}{1-\alpha}A^H$ when $t = n\hat{t}$ for some $n \in \mathbb{N}$.

If (24) does not hold and $\sigma_H \leq 1/2$, then the oligarchic equilibrium is identical to the democratic equilibrium in Proposition 2.

3.3 Comparison Between Democracy and Oligarchy

The last two subsections highlighted a number of differences between democratic and oligarchic equilibria. This subsection compares aggregate output and its dynamics in the democratic and oligarchic equilibria.[29] To simplify the discussion, I focus on the case where (24) holds, so that the oligarchic equilibrium does not have cycles.

The first important result is that aggregate output in the initial period of the oligarchic equilibrium, i.e., Y_0^E, is greater than the constant level of output in the democratic equilibrium, Y^D. In other words, if $\delta > 0$, then

$$Y^D = \frac{1}{1-\alpha}(1-\delta)^{\frac{1-\alpha}{\alpha}} A^H < Y_0^E = \frac{1}{1-\alpha}A^H.$$

Therefore, for all $\delta > 0$, oligarchy initially generates greater output than democracy, because it is protecting the property rights of entrepreneurs.[30] However, the analysis also shows that Y_t^E declines over time, while Y^D is constant. Consequently, the oligarchic economy may subsequently fall behind the democratic society. Whether it does so or not depends on whether Y^D is greater than Y_∞^E as given by (26). This will be the case if $(1-\delta)^{\frac{1-\alpha}{\alpha}} A^H / (1-\alpha) > \left(A^L + M(A^H - A^L)\right) / (1-\alpha)$, or if

$$(1-\delta)^{\frac{1-\alpha}{\alpha}} > \frac{A^L}{A^H} + M\left(1 - \frac{A^L}{A^H}\right). \tag{27}$$

[29] It can be verified that all the results here also hold for the comparison of net output levels.

[30] The result that the oligarchic equilibrium always generates greater output than the democratic equilibrium at time $t = 0$ is a consequence of the assumption that the only source of distortion in oligarchy is the entry barriers. In practice, an oligarchic society could pursue other distortionary policies to reduce wages and increase profits, in which case it might generate lower output than a democratic society even at time $t = 0$.

If condition (27) holds, then at some point the democratic society will overtake ("leapfrog") the oligarchic society. (27) is more likely to hold when δ, A^L/A^H and M are low. In other words, if democracy will pursue highly "populist" policies imposing high taxes on businesses in order to redistribute income to the poor, and if the cost of misallocation of talent in the economy is low, then the oligarchic equilibrium always generates greater output. The cost of misallocation of talent will be low, in turn, when either the skill gap between low and high-productivity entrepreneurs is limited (A^L/A^H high) or when the population average of high-productivity agents is high (M high). On the other hand, if the extent of taxation in democracy is limited and the failure to allocate the right agents to entrepreneurship is very costly, then societies stuck in oligarchy will ultimately fall behind democratic societies.[31]

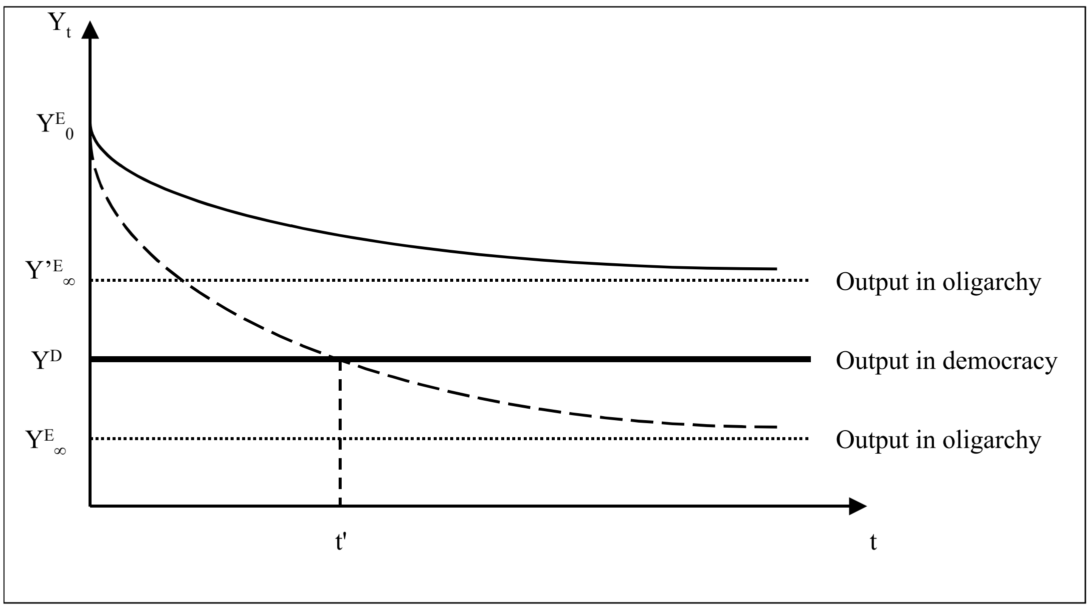

Figure 4: Comparison of aggregate output in democracy and oligarchy. The dashed curve depicts output in oligarchy when (27) holds, and the solid line when it does not.

[31]Notice that if (24) does not hold and the oligarchic equilibrium is cyclic, then it generates greater income than the case discussed in the text. More formally, let Y_t^E be the aggregate equilibrium output in the non-cyclic oligarchic equilibrium at time t, and $\tilde{Y}_t^E$ be the aggregate equilibrium output in the cyclic oligarchic equilibrium. Suppose that condition (24) holds as an equality, so that both the non-cyclic and the cyclic equilibria exist. Then, we have that $\tilde{Y}_t^E = Y_t^E$ for all $t < \hat{t}$ and $\tilde{Y}_t^E > Y_t^E$ for all $t \geq \hat{t}$. Nevertheless, democracy may still generate greater aggregate output than the cyclic oligarchic equilibrium. In other words, $\tilde{Y}_t^E < Y^D$ is still possible, though more difficult (and naturally, this will only be the case if $\tilde{Y}_{\hat{t}-1}^E < Y^D$, where, by definition, $\tilde{Y}_{\hat{t}-1}^E$ is the minimum aggregate output level reached by the cyclic oligarchic equilibrium).

Figure 4 illustrates both of these possibilities diagrammatically. The thick flat line shows the level of aggregate output in democracy, Y^D. The other two curves depict the level of output in oligarchy, Y_t^E, as a function of time for the case where (27) holds and for the case where it does not. Both of these curves asymptote to some limit, either Y_∞^E or $Y_\infty^{\prime E}$, which may lie below or above Y^D. The dashed curve shows the case where (27) holds, so after a while (in the figure after date t'), oligarchy generates less output than democracy. When (27) does not hold, the solid curve applies, and aggregate output in oligarchy asymptotes to a level higher than Y^D.

It is also useful to point out that some alternative arrangements would dominate both democracy and oligarchy in terms of aggregate output performance. For example, a society may restrict the amount to redistribution by placing a constitutional limit on taxation, and let the decisions on entry barriers be made democratically. Alternately, it may prevent entry barriers constitutionally, and place the taxation decisions in the hands of the oligarchy. The perspective here is that these arrangements are not possible in practice because of the inherent commitment problem in politics: those with the political power in their hands make the policy decisions, and previous promises are not necessarily credible. Consequently, it is not possible to give political power to incumbent producers, and then expect them not to use their political power to erect entry barriers, or vest political power with the poorer agents and expect them not to favor redistribution.

What about the preferences of different groups over regimes? It is clear that non-elites are always better off in democracy than in oligarchy. To see this, note that non-elites receive 0 income in oligarchy, so the utility of a non-elite agent born with bequest b_t^j is b_t^j. By comparison, Assumption (15) guarantees that the wage rate in democracy, W^w, given by (21), is positive, so the same agent will have utility $b_t^j + W^w > b_t^j$. Therefore, non-elites are always better off in democracy. In contrast, as long as condition (24) holds, all elites prefer the oligarchic solution, since, as shown above, they all vote for $\tau_t = 0$ and $k_t = k^E$ (if this condition does not hold, high-productivity elites prefer oligarchy, while low-productivity elites prefer democracy). There is therefore a conflict between the elites and non-elites over the type of political regime.

Oligarchy also typically generates more inequality relative to democracy. Recall that in democracy, workers' and entrepreneurs' incomes are given by (21) and (22). In contrast, in the non-cyclic oligarchic equilibrium, entrepreneurs (elites) erect entry barriers to depress labor demand and wages, and consequently, workers earn $w_t^e = 0$, while entrepreneurs earn

$W_t^E = \lambda Y_t^E$.[32] The analysis also reveals that there is greater social mobility in democracy than in oligarchy: in oligarchy, the equilibrium is sclerotic and the same dynasties run the firms, whereas in democracy there is continuous churning in the ranks of entrepreneurship and production work.

3.4 New Technologies

The Introduction discussed the possibility of a more democratic society, such as the United States at the end of the eighteenth century, adapting better to the arrival of new investment or technological opportunities than an oligarchy, such as those in the Caribbean. The model here also provides a potential explanation for this pattern.

Suppose that at some date $t' > 0$ a new technology arrives exogenously.[33] Let us think of this new technology as a new production method, enabling entrepreneur j to produce:

$$y_t^j = \frac{1}{1-\alpha}(\psi \hat{a}_t^j)^\alpha (e_t^j)^{1-\alpha}(l_t^j)^\alpha,$$

where $\psi > 1$ and $\hat{a}_t^j$ is the talent of this entrepreneur with the new technology. Therefore, entrepreneur j's output can be written as

$$\max\left\{\frac{1}{1-\alpha}(\psi \hat{a}_t^j)^\alpha (e_t^j)^{1-\alpha}(l_t^j)^\alpha, \frac{1}{1-\alpha}(a_t^j)^\alpha (e_t^j)^{1-\alpha}(l_t^j)^\alpha\right\}.$$

The cost of operating this technology is assumed to be the same as the old technology, $\kappa\lambda$. Also to simplify the discussion, assume that the law of motion of $\hat{a}_t^j$ is similar to that of a_t^j, given by

[32] The ratio of elite to non-elite income is always higher in oligarchy. The difference in incomes is also typically higher in oligarchy. This (absolute) income gap is equal to $\lambda Y_t^E = \mu_t \frac{1}{1-\alpha} A^H \lambda + (1-\mu_t)\frac{1}{1-\alpha} A^L \lambda$ in oligarchy, and to $(1-\delta)^{1/\alpha} A^H \lambda + \kappa\lambda$ in democracy. The income gap in democracy, as we saw above, compensates entrepreneurs for the costs of effort. It can be verified that as long as $Y_t^E \geq Y^D$, the income gap is greater in oligarchy than in democracy. However, if Y_t^E is much smaller than Y^D, the converse may be the case. This happens only for extreme parameter values: when A^L is very low, so that aggregate income and thus entrepreneurial profits are low in oligarchy, while δ is low and κ is high so that the compensating income differential that entrepreneurs receive in democracy is large. For example, the condition

$$(1-\alpha)\left((1-\delta)^{\frac{1}{\alpha}} + \kappa\lambda\right) < A^L/A^H + M\left(1 - A^L/A^H\right),$$

is sufficient (but not necessary) to ensure that the income gap between entrepreneurs and workers is always greater in oligarchy than in democracy (also note that this condition is compatible with (27)).

[33] An interesting question is whether democratic and oligarchic societies would have different propensities to invent new technologies, which is sidestepped here by assuming exogenous arrival of the new technology.

$$\hat{a}^j_{t+1} = \begin{cases} A^H & \text{with probability } \sigma_H & \text{if } \hat{a}^j_t = A^H \\ A^H & \text{with probability } \sigma_L & \text{if } \hat{a}^j_t = A^L \\ A^L & \text{with probability } 1-\sigma_H & \text{if } \hat{a}^j_t = A^H \\ A^L & \text{with probability } 1-\sigma_L & \text{if } \hat{a}^j_t = A^L \end{cases}, \tag{28}$$

for all $t > t'$ and $Pr\left(\hat{a}^j_t = A^H \mid a^j_{\tilde{t}}\right) = M$ for any $t, \tilde{t}$ and $a^j_{\tilde{t}}$. In other words, $\hat{a}^j_t$, and in particular $\hat{a}^j_{t'}$, is independent of past and future a^j_t's. This implies that $\hat{a}^j_{t'} = A^H$ with probability M and $\hat{a}^j_{t'} = A^L$ with probability $1 - M$ irrespective of the talent of the individual with the old technology. This is reasonable since new technologies exploit different skills and create different comparative advantages than the old ones.

It is straightforward to see that the structure of the democratic equilibrium is not affected, and at the time t', agents with comparative advantage for the new technology become the entrepreneurs, so aggregate output jumps from Y^D as given by (20) to

$$\hat{Y}^D \equiv \frac{1}{1-\alpha}(1-\delta)^{\frac{1-\alpha}{\alpha}}\psi A^H.$$

In contrast, in oligarchy, the elites are in power at time t', and as long as a modified form of condition (24) is satisfied, they would like to remain the entrepreneurs even if they do not have comparative advantage for working with the new technology. This modified condition is:

$$\lambda > \frac{\frac{1}{1-\alpha}\left[\alpha(1-\delta)^{1/\alpha} + \delta(1-\delta)^{(1-\alpha)/\alpha}\right]\psi A^H - \kappa}{\frac{\alpha}{1-\alpha}\max\left\{\psi A^L, A^H\right\} - \kappa}. \tag{29}$$

It states that remaining a low-productivity entrepreneur with the new technology, with productivity ψA^L, or a high-productivity entrepreneur with the old technology, with productivity A^H, in both cases protected by maximum entry barriers, is preferable to working at the competitive wage and receiving redistribution at the rate δ in the entry equilibrium (which gives an income of $\frac{1}{1-\alpha}\left[\alpha(1-\delta)^{1/\alpha} + \delta(1-\delta)^{(1-\alpha)/\alpha}\right]\psi A^H - \kappa$). As long as (29) is satisfied, the oligarchic equilibrium will remain sclerotic even after the arrival of the new technology.

How aggregate output in the oligarchic equilibrium changes after date t' depends on whether $\psi A^L > A^H$ or not. If it is, then all incumbents switch to the new technology and aggregate output in the oligarchic equilibrium at date t' jumps up to

$$\hat{Y}^E_\infty \equiv \frac{\psi}{1-\alpha}\left(A^L + M(A^H - A^L)\right),$$

and remains at this level thereafter. This is because $\hat{a}^j_t$ and a^j_t are independent, so applying the weak law of large numbers, exactly a fraction M of the elite have high productivity with the new technology, and the remainder have low productivity.

If, on the other hand, $\psi A^L < A^H$, then those elites who have high productivity with the old technology but turn out to have low productivity with the new technology prefer to use the old technology, and aggregate output after date t' follows the law of motion

$$\tilde{Y}_t^E = \frac{1}{1-\alpha}\left[M\psi A^H + \mu_t (1-M) A^H + (1-\mu_t)(1-M)\psi A^L\right],$$

with μ_t given by the same process as before, (16). Intuitively, now the members of the elite who have high productivity with the new technology and those who have low productivity with the old technology switch to the new technology, while those with high productivity with the old and low productivity with the new remain with the old technology (they switch to new technology only when they lose their high-productivity status with the old technology). As a result, we have that $\tilde{Y}_t^E$, just like Y_t^E before, is decreasing over time, with $\lim_{t\to\infty} \tilde{Y}_t^E = \frac{1}{1-\alpha}\left[M\psi A^H + M(1-M) A^H + (1-M)^2 \psi A^L\right]$.

More important for the focus here, it is easy to verify that, as long as $Y_\infty^E \leq Y^D$, the gap $\hat{Y}^D - \hat{Y}^E$ or $\hat{Y}^D - \tilde{Y}_t^E$ (or whichever is relevant) is always greater than the output gap before the arrival of the new technology, $Y^D - Y_t^E$ (for $t > t'$). In other words, the arrival of the new technology creates a further advantage for the democratic society. In fact, it may have been the case that $Y^D - Y_t^E < 0$, i.e., before the arrival of the new technology, the oligarchic society was richer than the democratic society, but the ranking is reversed after the arrival of the new technology at date t'. Intuitively, this is because the democratic society immediately makes full use of the new technology by allowing those who have a comparative advantage to enter entrepreneurship, while the oligarchic society typically fails to do so, and therefore has greater difficulty adapting to technological change.[34]

4 Regime Changes

The previous section characterized the political equilibrium under two different scenarios; democracy and oligarchy. Which political system prevails in a given society was treated as exogenous. Why are certain societies democratic, while others are more oligarchic, with the elite in control of political power? One possibility at this point is to appeal to historical accident, while another is to construct a "behind-the-veil" argument, whereby whichever political system leads to greater efficiency or ex ante utility would prevail. Neither of these two approaches are entirely satisfactory, however. First, since the prevailing

[34] In practice, it may also be the case that entrepreneurial talent matters more for new technologies than for old technologies, creating yet another reason for democratic societies to take better advantage of new technologies.

political regime influences economic outcomes, rational agents should have preferences over these regimes as well, thus boding against a view which treats differences in regimes as exogenous. Second, political regimes matter precisely because they regulate the conflict of interest between different groups (in this context, between workers and entrepreneurs). The behind-the-veil argument is unsatisfactory, since it recognizes and models this conflict to determine the equilibrium within a particular regime, but then ignores it when there is a choice of regime. Finally, neither of these two approaches provide a framework for analyzing changes in regime, which are ubiquitous. A more satisfactory approach would be to let the same trade-offs emphasized above also affect which regimes will emerge and persist in equilibrium. In this section, I make a preliminary attempt in this direction.[35]

I consider an economy where non-elites would like to switch from oligarchy to democracy, while elites would like to preserve the oligarchic system. How will these conflicting interests be mediated? A plausible answer is that there is no easy compromise,[36] and whichever group is politically or militarily more powerful will prevail. This is the perspective adopted in this section, and the political or military power of a group is linked to its economic power. In other words, in the conflict between the elites and the non-elites, the likelihood that the elite will prevail is increasing in their relative economic strength or in their relative wealth. This assumption is plausible: a non-democratic regime often transforms itself into a more democratic one in the face of threats or unrest, and the degree to which the regime will be able to protect itself depends on the resources available to it (e.g., see the discussion in Acemoglu and Robinson, 2003).

4.1 Basic Model

Suppose that the society starts as an oligarchy, and if it switches to democracy, it remains democratic thereafter. I model the effect of economic power on political power in a reduced-form way, and assume that the probability that an oligarchy switches to democracy is

$$p_t = p\left(\Delta B_t\right),$$

[35] See Acemoglu and Robinson (2000, 2003) for a class of models of equilibrium political institutions, with an emphasis on shifts in political power between poorer and richer segments of the society. These models do not consider the economic trade-offs between distortionary taxation and entry barriers.

[36] It may be argued that there should be room for compromise, since one of the regimes generates greater aggregate income (efficiency), and this income can be redistricted in a way to make all parties better off. This type of argument ignores the constraints that commitment problems place on feasible redistributions (e.g., Acemoglu, 2003).

where

$$\Delta B_t \equiv B_t^E - B_t^W = \frac{\int_{j\in I_t} b_t^j dj}{\int_{j\in I_t} dj} - \frac{\int_{j\notin I_t} b_t^j dj}{\int_{j\notin I_t} dj} \tag{30}$$

is the per capita wealth difference between the elites and the non-elites (workers) at the beginning of period t.[37] I assume that regime change takes place immediately at the beginning of the period. Using $D_t = 0$ to denote oligarchy and $D_t = 1$ to denote democracy, the points emphasized above can be captured by the following law of motion for D_t:

$$D_t = \begin{cases} 0 & \text{with probability } 1 - p(\Delta B_t) & \text{if } D_{t-1} = 0 \\ 1 & \text{with probability } p(\Delta B_t) & \text{if } D_{t-1} = 0 \\ 1 & & \text{if } D_{t-1} = 1 \end{cases}. \tag{31}$$

The assumption that economic power buys political power is equivalent to $p(\cdot)$ being decreasing. In the analysis below, I allow $p(\cdot)$ to be non-increasing.

Definition (Equilibrium With Regime Changes) An equilibrium with regime changes is a policy sequence $\left\{\hat{k}_t, \hat{\tau}_t\right\}_{t=0,1,\ldots}$ and economic decisions $\left\{\left[\hat{x}_t^j\right]\right\}_{t=0,1,\ldots}$ such that $\left\{\left[\hat{x}_t^j\right]\right\}_{t=0,1,\ldots}$ is an economic equilibrium given $\left\{\hat{k}_t, \hat{\tau}_t\right\}_{t=0,1,\ldots}$ and

- if $D_t = 0$, then $\left(\hat{k}_t, \hat{\tau}_t\right)$ is the oligarchic equilibrium policy sequence, and
- if $D_t = 1$, then $\left(\hat{k}_t, \hat{\tau}_t\right)$ is the democratic equilibrium policy sequence,

where D_t is given by (31) with $D_0 = 0$ and

$$\Delta B_t = \beta\left(\Delta B_{t-1} + \lambda Y_{t-1}^E\right) \text{ if } D_{t-1} = 0$$

and Y_{t-1}^E is given by (25).

This definition makes use of the fact that since $D_t = 0$, $b_0^j = 0$ for all j and $w_t^e = 0$ in an oligarchic equilibrium, $B_t^W = 0$, thus $\Delta B_t = B_t^E$. It then uses the savings rule in (2) and the fact that in oligarchy each member of the the elite earns an income of λY_t^E.

[37] Note that an alternative would have been to make political power a function of the relative wealth levels of elites and workers. In the current model, this is not possible, since the long-run wealth level of workers is 0 even if they start with positive wealth. To accommodate this possibility, we can assume that the minimum wage is positive, say $\underline{w} > 0$, for example because of an outside option. In this case, it can be shown that if all agents also start with positive wealth, the ratio of elite wealth to worker wealth will first increase and then decline. The result that there can be multiple steady-state equilibria derived in Proposition 5 below generalizes irrespective of whether or not the relevant measure of inequality increases monotonically in oligarchy—it only relies on the feature that there is greater inequality in oligarchy than in democracy.

Now imagine the equilibrium path of this economy starting at $t = 0$. To simplify the discussion, suppose that condition (24) is satisfied, so that the oligarchic equilibrium is not cyclic. Since each agent is imperfectly altruistic, the possibility of regime change in the future does not affect behavior, so the equilibria characterized above as a function of the political regime continue to apply. Therefore, at $t = 0$, we will have the oligarchic equilibrium, with no redistribution and 0 wages, and so $W_0^E = \lambda Y_0^E$ and $W_0^W = 0$, where W_0^E and W_0^W denote the per capita incomes of elites and non-elites respectively, and Y_0^E is given by (25). Given the savings rule implied by (2), we therefore have

$$B_1^E = \Delta B_1 = \beta \lambda Y_0^E.$$

With the same argument, if the society remains oligarchic, we have

$$B_2^E = \Delta B_2 = \beta \lambda Y_1^E + \beta^2 \lambda Y_0^E,$$

or more generally,

$$B_t^W = 0 \text{ and } B_t^E = \Delta B_t = \lambda \sum_{n=1}^{t} \beta^n Y_{t-n}^E. \tag{32}$$

It is clear that ΔB_t is an increasing sequence, and so p_t will be a non-increasing sequence. Therefore, the longer the society remains as an oligarchy, the bigger the wealth gap between the elites and the non-elites, and the more difficult for the society to transition to democracy.

Moreover, note that

$$\lim_{t \to \infty} \Delta B_t = \Delta B_\infty \equiv \frac{\lambda Y_\infty^E}{1 - \beta}, \tag{33}$$

where Y_∞^E is given by (26). Now two interesting cases can be distinguished:[38] (1) There exists $\Delta \bar{B} < \Delta B_\infty$ such that $p\left(\Delta \bar{B}\right) = 0$. (2) $p\left(\Delta B_\infty\right) > 0$. In the former case, there also exists $\bar{t}$ such that for all $t \geq \bar{t}$, we have $\Delta B_t \geq \Delta \bar{B}$, so if the economy does not switch to democracy before $\bar{t}$, it will be permanently stuck in oligarchy. In the second case, as time passes, the economy will switch out of oligarchy into democracy with probability 1.

The next proposition summarizes the equilibrium path with potential regime changes (proof in the text):

Proposition 4 In the economy described above, the equilibrium with regime change is as follows: the economy starts with $D_0 = 0$ and the oligarchic equilibrium, and transitions

[38] A third possibility is $\lim_{t \to \infty} p\left(\Delta B_t\right) = 0$, in which case the nature of the limiting equilibrium depends on the rate at which $p\left(\Delta B_t\right)$ converges to 0.

to the democratic equilibrium according to the law motion as given by (31) with $\Delta B_t = \lambda \sum_{n=1}^{t} \beta^n Y^E_{t-n}$, and remains democratic thereafter. In addition:

- suppose that there exists $\Delta \bar{B} < \Delta B_\infty$ such that $p\left(\Delta \bar{B}\right) = 0$ where ΔB_∞ is given by (33), and let $\bar{t} = \min t \in \mathbb{N} : \Delta B_t \geq \Delta \bar{B}$. If the economy remains oligarchic until $\bar{t}$, then it will always remain oligarchic—i.e., if $D_{\bar{t}} = 0$, then $D_t = 0$ for all $t > \bar{t}$;

- suppose that $p\left(\Delta B_\infty\right) > 0$, then the society will become democratic at some point, i.e., $\Pr\left(\lim_{t\to\infty} D_t = 1\right) = 1$.

4.2 Path Dependence and Instability

Finally, consider a generalization of the above framework where democratic societies can switch back to oligarchy, and to simplify the discussion, assume that if there is a switch to oligarchy, the agents with $s^j_1 = 1$ (i.e., the initial elite) become the elite.[39] In particular, assume that when democratic, a society becomes oligarchic with probability

$$q_t = q\left(\Delta B_t\right)$$

where now $q(\cdot)$ is a non-decreasing function, $q(0) = 0$, and ΔB_t now refers to the wealth gap between the initial elite (those with $s^j_1 = 1$) and the initial non-elite (those with $s^j_1 = 0$), thus $\Delta B_t = \int_{j:s^j_1=1} b^j_t dj/\lambda - \int_{j:s^j_1=0} b^j_t dj/\left(1-\lambda\right)$.

Similar arguments to before establish that

$$D_t = \begin{cases} 0 & \text{with probability } 1 - p\left(\Delta B_t\right) & \text{if } D_{t-1} = 0 \\ 1 & \text{with probability } p\left(\Delta B_t\right) & \text{if } D_{t-1} = 0 \\ 0 & \text{with probability } q\left(\Delta B_t\right) & \text{if } D_{t-1} = 1 \\ 1 & \text{with probability } 1 - q\left(\Delta B_t\right) & \text{if } D_{t-1} = 1 \end{cases}, \tag{34}$$

In addition, the law of motion of ΔB_t is given by:

$$\Delta B_t = \begin{cases} \beta\left(\Delta B_{t-1} + \lambda Y^E_{t-1}\right) & \text{if } D_{t-1} = 0 \\ \beta \Delta B_{t-1} & \text{if } D_{t-1} = 1 \end{cases}, \tag{35}$$

which exploits the fact that after the switch to democracy, by the weak law of large numbers, a fraction M of the previous elites and a fraction M of the previous non-elites will become entrepreneurs and earn the higher income W^e_t given by (22), so the average

[39] The alternative would be for the agents who currently have $s_t = 1$ to become the elite. This would require us to keep track of the entire wealth distribution, which becomes quite involved.

incomes of previous elites and non-elites will be equal, and the only source of wealth differences among individuals is differences in their bequests, i.e., "initial" conditions.

The definition of an equilibrium with regime change is modified in a straightforward way by replacing (31) with (34). In addition, in order to provide a simple example of path dependence, I now allow the society to start as democratic, i.e., with $D_0 = 1$.

Rather than providing a full description of all potential types of equilibria, here I focus on certain cases of interest, which are summarized in the following proposition:

Proposition 5 Suppose there exists $\Delta\bar{B} < \Delta B_\infty$ such that $p\left(\Delta\bar{B}\right) = 0$ where ΔB_∞ is given by (33) and let $\bar{t} = \min t \in \mathbb{N} : \Delta B_t \geq \Delta\bar{B}$ with ΔB_t given by (32), and that there exists $\Delta\tilde{B} > 0$ such that $q\left(\Delta\tilde{B}\right) = 0$, and let $\tilde{t}\,(t') = \min t \in \mathbb{N} : \Delta B_t \leq \Delta\tilde{B}$ where ΔB_t is given by (35) starting at $t = t'$ with $\Delta B_{t'}$ given by (32). Then:

- If $D_0 = 1$, then $D_t = 1$ for all t; i.e., if a society starts as democratic, it will remain democratic thereafter.

- If $D_0 = 0$ and $D_{t'} = 1$ for the first time in t', and $D_t = 1$ for all $t \in \left[t', t' + \tilde{t}\,(t')\right]$, then $D_t = 1$ for all $t \geq t'$; i.e., if a society becomes democratic at t' and remains democratic for $\tilde{t}\,(t')$ periods, it will remain democratic thereafter.

- If $D_0 = 0$ and $D_t = 0$ for all $t \leq \bar{t}$, then $D_t = 0$ for all t; i.e., if a society starts oligarchic and remains oligarchic until $\bar{t}$, then it will always remain oligarchic.

- If $D_0 = 0$ and $D_{t'} = 1$, then the probability of switching back to oligarchy for the first time at time $t > t'$ after the switch to democracy at t', $Q_{t|t'}$ is non-increasing in t and non-decreasing in t', with $\lim_{t\to\infty} Q_{t|t'} = 0$—i.e., a society faces the highest probability of switching back to oligarchy immediately after the switch from oligarchy to democracy, and this probability is higher if it has spent a longer time in oligarchy.

The first three parts of the proposition follow from the preceding discussion. To see why the last part is correct, note that a greater t' implies that the society spent longer in oligarchy, so ΔB_t, and hence the probability of switching back to oligarchy, is higher. A greater t given t', on the other hand, corresponds to the society having spent a longer time in democracy, reducing the wealth gap between the initial elites and non-elites, and consequently, the probability of switchback to oligarchy. Moreover, as $t - t' \to \infty$, equation (35) implies that $\Delta B_t \to 0$, so $q\,(\Delta B_t) \to 0$.

There are two interesting results contained in this proposition. The first is the possibility of path dependence. Of two identical societies, if one starts oligarchic and the other as democratic, they can follow very different political and economic trajectories. With the assumption that $q(0) = 0$, the initial democracy will always remain democratic, generate an income level Y^D and an equal distribution of income, ensuring that $\Delta B_t = 0$ and therefore $q = 0$. On the other hand, if it starts oligarchic, it will follow the oligarchic equilibrium, with an unequal distribution of income. The greater income of the elites will enable them to have the power to sustain the oligarchic equilibrium, and if there is no transition to democracy until some point, date $\bar{t}$ (which may be $t = 0$), they will be sufficiently richer than workers to be able to sustain the oligarchic regime forever. This type of path dependence provides a potential explanation for the different development experiences in the Americas suggested by Engerman and Sokoloff (1997) and Acemoglu, Johnson and Robinson (2002). Similar path dependence will also result if a society is originally an oligarchy, but then switches to democracy and remains democratic for a sufficiently long period of time, so that inequality created during the oligarchic phase diminishes significantly and democracy becomes fully consolidated.[40]

Another interesting result is that a democracy is predicted to be most susceptible to collapse right after transition from oligarchy to democracy, because, at this point, the previous elites are still substantially richer than the workers. As time goes by the wealth gap will decline, and democracy will become more stable. Moreover, the longer lived is oligarchy before the switch to democracy, the larger is the wealth gap between the elites and the workers, and the less stable is democracy.

5 Conclusion

There is now a general consensus that "institutions" have a first-order effect on economic development. But we are far from understanding what these institutions are. Many economists and political scientists believe that the extent of property rights enforcement is an important element of this set of institutions, but even here there are fundamental unanswered questions. Most notably, whose property rights should be protected? This question becomes particularly pertinent when there is a conflict between protecting the property rights of various different groups.

[40] See also Benabou (2000) for a model featuring multiple steady-state equilibria, one with high inequality and policies that are more favorable to the rich, and another with lower inequality and greater redistribution towards the poor.

This paper develops a model where protecting the property rights of current producers comes at the cost of weakening the property rights of future producers. This is because effective protection of the property rights of current producers requires them to have political power, which they can use to erect entry barriers, violating the property rights of future producers. This pattern of well-enforced property rights for current producers and monopoly-creating entry barriers in an oligarchic society contrasts with relatively high taxes on current producers but low entry barriers in a democratic society.

I develop a simple framework to analyze the trade-off between these two different forms of property rights enforcement. I show that an oligarchic society first generates greater efficiency, because agents who are selected into entrepreneurship are often those with a comparative advantage in that sector and oligarchy avoids the distortion effects of redistributive taxation. But, as time goes by and comparative advantage in entrepreneurship shifts away from the incumbents to new agents, the allocation of resources in oligarchy worsens. Contrasting with this, democracy creates distortions because of the disincentive effects of taxation, but these distortions do not worsen over time. Therefore, a possible path of development for an oligarchic society is to first rise and then fall relative to a more democratic/open society.

The model therefore provides a potential explanation for relatively high growth rates of many societies with oligarchic features, both historically and during the postwar era, but also suggests a reason for why they often run into significant growth slowdowns. In addition, it predicts that oligarchic societies may fail to take advantage of new growth opportunities, as was the case with the highly oligarchic and relatively prosperous Caribbean plantation economies, which failed to invest in industry and new technology, while the initially-less-prosperous North American colonies industrialized.

I also use this framework to discuss endogenous regime transitions, in particular, to highlight the possibility of path dependence. Path dependence arises because those enriched by the oligarchic regime can use their resources to sustain the system that serves their interests. As a result, two otherwise identical societies that start with different political regimes may generate significantly different income distributions, which in turn sustain different political regimes and hence economic outcomes.

The paper also suggests a number of areas for future research. On the theoretical side, a number of questions are left open. First, the model assumes that members of the elite can only keep their status by managing their own firms, even if they have low-productivity. In practice, delegating managerial positions to more productive agents is an option. Incorporating this possibility into the current framework is relatively straightforward, but there might also be more interesting angles to study. For example, when entry barriers are sufficiently high, high-skill individuals may not start their own businesses, thus creating a sufficient pool of managerial talent, and indirectly increasing the profitability and durability of an oligarchic regime. Second, in a world with innovations and creative destruction, sufficiently successful (creative) entrepreneurs may possess the economic and political resources to buy protection and entry barriers, thus creating another link between initial success and later stagnation. Finally, and perhaps most importantly, the model of politics in this paper is rudimentary. More micro-founded models of how economic power buys political power need to be developed in future work. On the empirical side, it is important to further investigate whether distortions in oligarchic societies are introduced by entry barriers, while those in democracies are caused by anti-business and redistributive policies, and whether there are any systematic patterns related to the rise and decline of oligarchies different from the dynamics of democratic societies.

6 Appendix: A More General Model

Here I briefly outline a simple generalization which ensures that even if voters choose taxes at the beginning of the period, i.e., before investment decisions, they would set a positive tax rate, and all the results of the main analysis generalize. In addition, in this model, we can dispense with the hiding decisions, h_t^j, since the tax rate preferred by the median voter, which trades off redistribution versus disincentive effects, is always less than 1.

Consider an economy similar to the one analyzed above, with the same technology and preferences, but with three levels of productivity, $A^V \geq A^H > A^L$. The law of motion of productivity is a generalization of (8). Define M^V as the fraction of very high-productivity agents in the society and M^H as the fraction of high-productivity agents. Assume that

$$\lambda M^V < 1 < \lambda \left(M^V + M^H \right), \tag{A1}$$

which implies that the "marginal" entrepreneur is the high-productivity type, because, even if there are no entry barriers, the very high-productivity entrepreneurs by themselves cannot hire the entire labor force.

Let us now assume that the timing of events is as follows:

1. Entrepreneurial talents, $\left[a_t^j\right]$, are realized.

2. The entry barrier for new entrepreneurs k_t and the tax rate, τ_t, are set.

3. Agents make occupational choices, $\left[i_t^j\right]$.

4. Entrepreneurs make investment and employment decisions, $\left[e_t^j, l_t^j\right]$.

5. The labor market clearing wage rate, w_t, is determined.

6. Consumption and bequest decisions, $\left[c_t^j, b_{t+1}^j\right]$ are made.

Most importantly, taxes, τ_t, are now set before the investment decisions, exactly at the same time as the entry barriers, k_t. Moreover, there is no hiding decision (in fact, no commitment problem).

Assumption (A1) implies that, in democracy, the equilibrium wage will be

$$w_t^e = \max \left\langle \frac{\alpha}{1-\alpha} (1-\tau_t)^{1/\alpha} A^H - \kappa ; 0 \right\rangle,$$

while tax revenues are:

$$T_t = \frac{1}{1-\alpha} \tau_t (1-\tau_t)^{\frac{1-\alpha}{\alpha}} \bar{A},$$

where $\bar{A}$ is a weighted average of A^V and A^H, reflecting the ratio of very high to high productivity entrepreneurs. In particular,

$$\bar{A} = \lambda M^V A^V + \left(1 - \lambda M^V\right) A^H \geq A^H.$$

Next note that in democracy, i.e., once entry barriers are 0, the preferences of agents with productivity equal to either A^L or A^H are given by

$$\frac{\alpha}{1-\alpha}(1-\tau)^{1/\alpha} A^H - \kappa + \frac{1}{1-\alpha}\tau(1-\tau)^{\frac{1-\alpha}{\alpha}} \bar{A}, \tag{A2}$$

because, in equilibrium, their utility is given by the wage rate plus redistribution (plus the bequest they have inherited)—agents with $a_t^j = A^H$ may become entrepreneurs, but they receive the same utility in this case. Since $M^V < 1/2$, the democratic tax rate will maximize (A2). The first-order condition for this maximization problem is

$$\frac{1}{1-\alpha}(1-\tau)^{\frac{1-\alpha}{\alpha}} \bar{A} - \frac{1}{1-\alpha}(1-\tau)^{\frac{1-\alpha}{\alpha}} A^H - \frac{1}{\alpha}\tau(1-\tau)^{\frac{1-\alpha}{\alpha}-1} \bar{A} \leq 0 \text{ and } \tau \geq 0$$

with complementary slackness. Inspection of this condition shows that if $\bar{A} = A^H$, then $\tau = 0$, which justifies the claim made in footnote 17. However, as long as $\bar{A} > A^H$, the solution to this problem is strictly positive, and voters set a positive tax rate,

$$\tau^d = \frac{\bar{A} - A^H}{\bar{A}/\alpha - A^H} < 1, \tag{A3}$$

to redistribute income from the entrepreneurs to themselves.

The rest of the analysis in the text applies, with the democratic equilibrium tax rate given by (A3), and the oligarchic equilibrium unchanged. As a result, output in democracy is now:

$$Y_t^D = Y^D \equiv \frac{1}{1-\alpha}(1-\tau_d)^{\frac{1-\alpha}{\alpha}} \bar{A},$$

whereas output in oligarchy in the initial period is:

$$Y_0^E = \frac{1}{1-\alpha}\bar{A} > Y^D,$$

but then limits to

$$\lim_{t\to\infty} Y_t^E = Y_\infty^E \equiv \frac{1}{1-\alpha}\left(A^L + M^H(A^H - A^L) + M^V(A^V - A^L)\right) < Y_0^E.$$

Whether Y_∞^E is lower than Y^D or not is determined by a similar analysis to that in the text, with the only interesting twist being that now the equilibrium tax rate, τ^d, is higher precisely when there is greater inequality among the entrepreneurs in terms of productivity. This implies that, somewhat paradoxically, oligarchy may be more efficient in societies with *greater* inequality in terms of productivity.

7 Appendix B: Tax Revenues and Democracy

Here I briefly discuss the empirical relationship between tax revenues and democracy, shown in Figure 1. Appendix Table B1 includes regressions of tax revenues as a percentage of GDP in 1998 on the democracy index and various controls. All economic variables, unless otherwise indicated, are from the World Development Indicators 2002 dataset, and the democracy index is from the Freedom House for 1997-98 or from the Polity IV dataset for 1998. The Freedom House measure is transformed so that both indices assign higher scores to greater democracy. It is important to note that tax revenue as a percentage of GDP refers only to the revenues of the central government.

Column 1 shows a strong raw correlation. The magnitude, 2.5 (standard error = 0.3) indicates that a change in democracy from the level of that in Myanmar (7) to the best score (1) would increase tax revenues over GDP by 15 percentage points. Column 2 shows that this relationship is robust to using the Polity index.

Since democracies are typically richer than nondemocracies the relationship in columns 1 and 2 may reflect the fact that taxes as a percentage of GDP increase with economic development. To control for this, columns 3 and 4 add log GDP per capita. Even though this reduces the coefficient on democracy a little, and log GDP per capita itself is significant, the overall relationship is unchanged, and there remains a statistically and economically significant correlation between democracy and tax revenues.

The remaining columns focus on the Freedom House index and add additional controls, including log of total population in 1998, average years of schooling in 1995 (from the Barro and Lee dataset), continent dummies, and dummies for OPEC member and formerly communist countries, and finally, column 10 adds all of these variables at the same time. The relationship remains strong and significant in all cases, though the addition of the continent dummies somewhat reduces the magnitude of the relationship.

Column 11 repeats the regression of column 3 excluding the formerly communist countries, and finally, column 12 excludes all federal countries (according to the list from Handbook of Federal Countries, 2002). None of these affect that the correlation between tax revenues and democracy.

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Appendix Table B1

Dependent Variable Tax Revenues as Percentage of GDP

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	Excluding ex communist countries (11)	Excluding federal countries (12)
Political rights	2.537		1.714		1.666	1.591	1.266	1.345	1.679	1.315	1.597	1.612
	(0.301)		(0.487)		(0.517)	(0.591)	(0.465)	(0.437)	(0.467)	(0.573)	(0.522)	(0.482)
Polity democracy index		1.292		0.717								
		(0.234)		(0.366)								
Log GDP per capita			2.515	3.466	2.506	2.119	2.069	3.088	2.694	1.511	2.274	3.420
			(1.090)	(1.226)	(1.105)	(1.764)	(0.982)	(0.982)	(1.057)	(1.463)	(1.109)	(1.154)
Log population					-0.472					-0.319		
					(0.413)					(0.570)		
Avg. years of schooling						0.395				0.182		
						(0.624)				(0.488)		
America							-9.725			-10.098		
							(1.874)			(2.571)		
Africa							-3.566			-3.842		
							(3.081)			(4.899)		
Asia							-9.835			-9.788		
							(2.474)			(3.657)		
Oceania							-4.902			-5.018		
							(2.899)			(4.301)		
OPEC								-7.523		-1.474		
								(4.436)		(4.142)		
Ex-communist									4.510	0.351		
									(1.749)	(2.546)		
N	100	91	97	89	97	62	97	97	97	62	75	82
R-squared	0.347	0.285	0.375	0.357	0.383	0.403	0.571	0.408	0.416	0.598	0.365	0.449

Robust standard errors in parentheses. Tax revenues, GDP per capita, and population are for 1998 and come from the World Bank's WDI 2002. Tax revenues are for central government only.
Political rights from Freedom House for 1997-98 and Polity IV for 1998, between 1 and 7, with higher scores corresponding to more democratic countries.
Average years of schooling of the population over age 15 is for 1995, from the Barro-Lee Data Set.