Democracy as a Middle Ground: A Unified Theory of Devlopment and Political Regimes*

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Abstract

We put forth a theory to explain the rather puzzling observation that while no long-lived autocratic country is currently among the rich industrial leaders and every long-lived democratic country is, democratic countries have not grown any faster than autocratic countries in the postwar period. Our theory builds on Mancur Olson's key insight that democratic regimes do not prevent growth inhibiting policies from being enacted because the benefits of such policies typically are concentrated within small groups whereas the costs are spread out over society. Thus, only the group wanting the bad policy will lobby the government. A benevolent autocrat, in contrast, will realize that the social costs of such policies exceed the social benefits, and hence will not allow such policies to be implemented. Hence, a country ruled by a good autocrat will grow faster than a democratic one starting with the same level of income. The problem with autocracy, however, is that a benevolent autocrat's successor might not be benevolent, and will expropriate the wealth of its citizens. For a poor country with little capital to expropriate, the optimal regime is autocracy for the reason that the cost of a drawing a self-interested autocrat is small compared to the benefit of drawing a benevolent one. However, as a country becomes rich and accumulates capital, these costs increase relative to the benefit, and at some point, the country switches to a democratic political regime. We illustrate our theory in a model of development and growth and relate its predictions to the empirical literature on economic performance and political regimes.

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1 Introduction

Whereas every long-lived democracy currently belongs to the set of the rich industrial countries and no long-lived autocratic country does, it is not the case that democratic countries have outperformed autocratic ones in the post World War II period. In fact, among the set of growth miracle countries, autocracy is the prevalent regime-type at the time the miracles began. In this paper we put forth a theory to explain this rather puzzling set of observations. According to our theory, autocratic rule is better on average than democratic rule for an economy's performance in the short-run, but worse in the long-run.

The theory rests on three main ideas. The first idea is that economic development does not benefit everyone in society. Some groups, particularly those with specialized factor inputs to the current technology, will suffer in the form of lower earnings. Sokoloff and Engermann (2000) have argued that landed elites, particularly in Latin America, stood to lose with industrialization as it implied higher wages to be paid to farm workers.

The second idea is that autocrats are not all alike. Autocrats differ in their preferences and objectives, and so will implement different policies, with very different consequences for development and growth. Some autocrats may have preferences that are in line with the country's landed elite, and thus maximize the welfare of that group by implementing growth retarding policy; others may have preferences that are entirely self-centered, and thus maximize their own consumption by implementing dramatic growth inhibiting policy; and still others may have preferences that are egalitarian, and thus maximize the welfare of society by not imposing any distortionary policy.

The third main idea is that democracy is not a panacea for growth as it does not guarantee that no barriers to development will be erected. Groups that stand to lose from industrialization are able to lobby a democratic regime to erect barriers to development on their behalf. While groups that would benefit from growth could also lobby the government, they are less likely to do so. As argued by Olson (1982), the costs of industrialization will be more likely concentrated in a small subset of society whereas the benefits are spread out among society as a whole. Consequently, individuals belonging to a group that stands to lose from industrialization have a greater incentive to lobby the government. Democracy, thus, is inherently

susceptible to the erection of barriers that retard development.

When combined, these three ingredients imply that democracy is a middle ground for development. A country ruled by a good autocrat will outperform a democracy, as a good autocrat both understands the negative effect that barriers that protect groups with interests vested to the status quo have on aggregate welfare, and because his political existence does not depend on the support of lobbies. A country ruled by an elite autocrat, or a kleptocratic one, however, will fare worse than a democratic one as both types of autocrats will implement policies that are worse for industrialization and growth.

Moreover, these three ingredients imply that as a country's living standard increases, the likelihood that it switches to a democratic system increases. The reason for this is that with development and the accumulation of wealth, the potential losses associated with a kleptocratic regime that accrue to individuals in a society, including the landed elite, who have the power to decide whether the country should remain autocratic, increase. While the ideal autocrat for a member of the landed elite is an individual who shares their preferences and thus would prevent development, nevertheless, they may opt for a democracy so as to avoid the chance that a kleptocrat comes to power. While the income accruing to a member of the landed elite under democracy is lower than the income they earn under their ideal autocrat, it is higher than what they earn under a kleptocrat.

We illustrate our theory in a model that combines elements from the political economy literature and the growth and development literature. On the growth and development side, we use the model of Hansen and Prescott (2002). This model gives rise to a period of stagnant living standards, followed by an industrial revolution, followed by a period of modern economic growth. The era of constant living standards is associated with the use of a traditional technology that uses land as well as capital and labor inputs. The industrial revolutions correspond to the first period in which it is profitable to use a modern technology to produce goods and services. In contrast to the traditional technology, the modern one only employs capital and labor. The Hansen and Prescott (2002) model is well suited to study the issues at hand because it implies that the rental rate on land declines as the economy industrializes and moves more capital and labor into the modern technology. Thus, within this model, the

group of landowners have an incentive to prevent industrialization.[1]

On the political economy side, we assume the class of landowners has the power to determine the country's political regime of the economy, namely autocracy or democracy. More specifically, as long as the country has maintained an autocratic regime in the past, this group at the start of the period decides whether the autocracy should be maintained or be abandoned in favor of a democracy. In both democratic and autocratic regimes, the leader sets the tax rate on capital and labor income earned in the modern sector, the tax rate on capital and labor income earned from the traditional sector, and a tax rate on land rental income.

Autocrats are randomly drawn from the population and differ in their preferences. There are three types: a kleptocrat whose utility depends only on his own consumption; a landed elite who shares the preferences of the landowners; and a benevolent autocrat who cares about the utility of everyone in society. By assumption, an autocrat's reign is only a single period so he sets tax rates with the sole objective of maximizing his utility. Moreover, in contrast to the selectorate framework of Besley and Kudamatsu (2007), the political elite cannot replace the autocrat in the period should he turn out to have preferences that differ from them, and thus wants to implement a tax rate policy that harms landowners. This happens if the autocrat turns out to be a kleptocrat, in which case tax rates on all forms of income are set to their maximum level, or if the autocrat turns out to be benevolent in which case the tax rates are set to zero. In contrast, when the autocrat belongs to the class of landowners, he will set a sufficiently high tax rate on modern sector income to ensure that no labor or capital will be employed in that sector.

Democratization is an irreversible decision. In the case the political elite make the irreversible decision to democratize, lobbying along the lines of Persson and Tabellini (2000) takes place. Accordingly, each candidate announces the tax rates to maximize their chance of being elected. Two candidates, one belonging to the class of landowners and the other one belonging to the landless class, are randomly drawn from the population. In the spirit of Olson (1982), we assume that only the landowner class constitute a lobby and thus are the only ones to make

[1] While we identify landowners as the group with vested interests in the status quo, none of our conclusions would change if we followed something along the lines of Krusell and Rios-Rull (1996) where workers who acquired capital in the old technology comprise the group that tries to prevent technological change.

campaign contributions. The landowner lobby will set the level of campaign contributions to maximize the probability that their preferred candidate wins.

Within this framework, we explore how the economy's performance depends on the type of political regime and how the choice of the policy regime depends on the economy's wealth. We begin by fixing the political regime and in the case of autocracy, the autocratic type, and trace the economy's performance under the assumption that the regime does not change over time in order to show that democracy is a middle ground. Next, we endogenize the political regime and show that the economy democratizes at some date once its accumulates enough wealth. We then explore how such factors as the relative size of the landed elite affect a country's economic and political development.

Our theory implies both a feedback from political regime to income as well as from income to regime. The causation from democracy to income is not simple as a good autocratic regime in our theory is better for a country's income. Thus, our theory is not inconsistent with Aghion et al. (2007) who find that democracy does not lead to higher growth. Our theory does imply a causation from income to democracy, and thus is inconsistent with the findings of Acemoglu et al. (2007), who find in a fixed effect model that income does not cause democracy over the postwar period, or twentieth century, but this result is controversial, and indeed puzzling, and even more so in light of the histories of democratic movements in several growth miracle countries. For instance, the political dialogue in several of the countries that experienced rapid increases in per capita income in the postwar period that transitioned to more democratic systems refers to the fear of expropriation of gains by future autocrats. Such dialogues were present in the democratization movements of Spain and Portugal in the late 1970's as well as in Taiwan. In Taiwan for example, rising living standard in the postwar period caused the GMD to include more people in the political process (Mau-Kei 2004).

The political and economic events in Argentina in the first half of the twentieth century perhaps best support our theory. As documented by Alston and Gallo (2007), Argentina began a transition to democracy as its per capita income level rose in the later part of the nineteenth century and first part of the twentieth century. In 1912, Argentina ended its autocratic tradition and adopted free elections with secret ballots. Between 1912 and 1930, democracy evolved

and strengthened. This abruptly halted with the downturn in the world economy associated with the *Great Depression*. Given this shock and its adverse effect on Argentina's output, the Conservatives who had controlled the political arena before 1912 resorted to fraud in order to wrestle power away from the Radical party.[2]

The paper is organized as follows. Section 2 documents the relation between political regime and development in the long-run and short run. Section 3 describes the model economy's structure. Section 4 characterizes the equilibrium for the model economy. Numerical experiments are reported in Section 5. Finally, Section 6 concludes the paper.

2 Empirical Observations

In this section we document some of the puzzling observations concerning the relation between political regime and development. We begin with an examination of the relation between income levels and stability. The relevant data is summarized in Figures 1 and 2. Figure 1 pertains to those countries that were listed as being democratic in 2000 according to the Polity indices from the Polity IV Project and is a reproduction of Persson and Tabellini (2007, Figure 1). Figure 2 pertains to those countries that were listed as being autocratic according to the Polity Indices from the Polity IV Project. Each figure plots a country's 2000 level of per capita GDP as reported by the PWT 6.2 against the number of years its 2000 regime has been in place. A country is identified as being democratic if its polity index is positive in the Polity IV data base and autocratic if it is negative. Figure 1 shows that no country with a long history of democratic rule is poor. Figure 2 shows that no country (outside the oil producers) with a long history of autocratic rule is rich.

Figures 1 and 2 here

While the long-run advantage of democracy is clear, the same cannot be said of the short run. In terms of levels, Figure 1 shows that living standards vary substantially for democratic regimes less than 50 years old. For autocracies that have existed for less than 50 years, incomes

[2] The discussion of the time indicates that the motivation behind the fraud was a belief by the Conservatives that they could do a better job of minimizing the effects of the Great Depression. We thank Andres Gallo for providing this historical information.

likewise vary substantially, although the fraction of autocratic countries that are rich is lower than the fraction of rich democratic countries. The advantage of short-lived democracy is far less clear. In terms of growth rates, several authors including Barro (1996) have found no significant positive effect of democracy on growth rates in the post war period at the aggregate level.

At the same time, the majority of countries that experienced a growth miracle, namely, a doubling of per capita output in a decade or less, was characterized by autocratic regimes at the time their miracle began. Out of the 16 countries that satisfy this definition of a growth miracle in the PWT6.2, nine were clearly autocratic according to the Polity Data Base when the miracle began. The set of countries includes Singapore, Taiwan, S. Korea, Botswana, Thailand, Cyprus, Japan, Romania, China, Malaysia, Indonesia, Portugal, Mauritius, and Ireland. Moreover, of the five fastest miracles, Singapore, Taiwan, S. Korea, Botswana, and Thailand, four started the miracle phase with autocratic polity measures; Botswana is the only democratic country. Additionally, all of these countries became more democratic as their income realized, except for Singapore that has maintained an iron-clad dictator since 1965. Figure 3 shows the polity measures for these five countries over the 1950-2004 period.

Figure 3 here

3 The Model

We start by describing the economic structure and maximization problems of the private agents in the model. Later, we describe the political structure of the economy. In effect, this section treats policy parametrically and examines the response of private agents given that a certain policy is in place. The next section effectively endogenizes these policies. The economic side of the model is essentially the development and growth model of Hansen and Prescott (2002) with two key differences. First, households are heterogenous with respect to their endowments, and second, households are taxed on their capital, land and labor income. The details of the model are as follows.

3.1 Business Sector

The business sector is perfectly competitive. Firms produce a single composite commodity by one of two technologies.

3.1.1 Malthus

The traditional Malthus technology uses land, labor and capital to produce the economy's final good. Let Y_{Mt} denote the output produced with this technology, K_{Mt} denote the capital input, H_{Mt} denote the labor input, and L_{Mt} denote the land input. Then

$$Y_{Mt} = A_{Mt} K_{Mt}^{\psi} H_{Mt}^{\phi} L_{Mt}^{1-\psi-\phi} \tag{1}$$

TFP, A_{Mt}, in the traditional technology grows exogenously at rate $\gamma_M \geq 0$. Thus, $A_{Mt+1} = (1+\gamma_M)A_{Mt}$.

3.1.2 Solow

The modern Solow technology uses labor and capital to produce the economy's final good. Let Y_{St} denote the output produced with this technology, K_{St} denote the capital input, and H_{St} denote the labor input. Then

$$Y_{St} = A_{St} K_{St}^{\theta} H_{St}^{1-\theta} \tag{2}$$

TFP, A_{St}, in the modern technology grows exogenously at rate $\gamma_S \geq 0$. Thus, $A_{St+1} = (1+\gamma_S)A_{St}$.

3.2 Household Sector

Households live for a single period. There are two types of households in the model, which we distinguish by the letter $j = e, p$. Type e households represent the class of elites and are endowed with the economy's land. Type p households represent the working class and are endowed with time. The measure of elite households is denoted by N_{et} and the measure of worker households is denoted by N_{pt}. The total population at time t is denoted $N_t = N_{pt} + N_{et}$.

3.2.1 Preferences

Households are the same with respect to preferences. Preferences are defined over consumption and bequests to offspring. In particular, utility is given by

$$U(c_{jt}, b_{jt}) = c_{jt}^{\mu} \left(n_{jt} b_{jt}\right)^{1-\mu}$$

where c_{jt} is household consumption, n_{jt} is the number of children, and b_{jt} are bequests per child of the type $j = e, p$ household. We do not write the number of children as an argument in the utility function because it is exogenous from the standpoint of the household.

3.2.2 Endowments

Household differ with respect to endowments. Elite households are endowed with the economy's stock of land, L. Thus, each elite household alive in period t has $l_t = L/N_{et}$ units of land which it can rent out to firms using the Malthusian technology. Elite households are not endowed with time. Worker households, in contrast, do not have a land endowment, but are endowed with one unit of time with which they can use to work in the business sector. Both households are endowed with capital. The amount of capital each type of household is endowed with is determined by the bequests of his parent. Thus, $k_{jt+1} = (1-\delta)\, k_{jt} + b_{jt}$ where δ is the depreciation rate. Land is passed on from parents to children. We assume that a family's land is divided equally among its offspring.

3.3 Demographics

As in Hansen and Prescott (2002), the growth rate of each group of households is exogenous, and depends on the average level of consumption in the economy $\overline{c}_t = (N_{et} c_{et} + N_{pt} c_{pt})/N_t$. The function that determines the number of children of a type j household is

$$n_{jt} = g_j\left(\overline{c}_t\right) \tag{3}$$

The population growth function is allowed to differ between household types. As in Hansen and Prescott, the population growth function must have a positive slope for low average consumption levels and a zero slope for high average levels of consumption. Such a growth rate

function is displayed in Figure 4. The first property is necessary for the model to display Malthusian properties whereas the second property is necessary so that the economy in the limit displays the balanced growth path properties of the Solow model.

3.4 Profit Maximization

As in Hansen and Prescott (2002), capital and labor in the economy are not technology-specific. However, as our model includes tax rates on household income that depend on the sector the income is generated, pre-tax rental rates on capital and labor need not be equal across sectors. Let r_{St} and w_{St} denote the pre-tax rental price of capital and labor in the modern sector; and let r_{Mt}, w_{Mt}, and r_{Lt} denote the pre-tax rental prices of capital, labor and land in the traditional sector.

Because land is only used in the traditional sector (and because it has no alternative use), the Malthusian technology will be used in every period. The profit maximizing conditions of Malthusian firms are

$$r_{Mt} = \psi A_{Mt} K_{Mt}^{\psi-1} H_{Mt}^{\phi} L_{Mt}^{1-\psi-\phi} \tag{4}$$

$$w_{Mt} = \phi A_{Mt} K_{Mt}^{\psi} H_{Mt}^{\phi-1} L_{Mt}^{1-\psi-\phi} \tag{5}$$

and

$$r_{Lt} = (1-\phi-\psi) A_{Mt} K_{Mt}^{\psi} H_{Mt}^{\phi} L_{Mt}^{-\psi-\phi} \tag{6}$$

The Solow technology, in contrast, need not be operated in a given period. If it is operated, it must be the case that firms using it make non-negative profits. The profits of a firm operating the Solow technology are

$$A_{St} K_{St}^{\theta} H_{St}^{1-\theta} - w_{St} H_{St} - r_{St} K_{St} \tag{7}$$

The profit maximizing conditions are

$$r_{St} \geq \theta A_{St} K_{St}^{\theta-1} H_{St}^{1-\theta} \tag{8}$$

$$w_{St} \geq (1-\theta) A_{St} K_{St}^{\theta} H_{St}^{\theta-1} \tag{9}$$

The condition under which the Solow technology is profitable to operate is essentially the same as the one derived in Hansen and Prescott (2002) except that tax rates enter the condition.

Recall, that Hansen and Prescott (2002) derive this condition by first using (8), to solve for the optimal capital input as a function of H_{St}. This is

$$K_{St} = \left(\frac{\theta A_{St}}{r_{St}}\right)^{1/(1-\theta)} H_{St} \tag{10}$$

Substituting (10) back into (7), profits are equal to

$$A_{St}\left[\frac{\theta A_{St}}{r_{St}}\right]^{\theta/(1-\theta)} H_{St} - w_{St}H_{St} - r_{St}\left[\frac{\theta A_{St}}{r_{St}}\right]^{1/(1-\theta)} H_{St}$$

This is linear in H_{St}, so a necessary condition for the modern technology to not be used is

$$A_{St} \leq \left[\frac{w_{St}}{1-\theta}\right]^{(1-\theta)} \left[\frac{r_{St}}{\theta}\right]^{\theta} \tag{11}$$

This is the condition derived in Hansen and Prescott (2002), which amounts to the condition that the minimum cost of producing one unit of output is above one. Here, however, with sector specific tax rates, the rental prices of labor and capital in the modern sector do not equal their counterparts in the traditional sector. After tax-rental prices will be equalized. Namely,

$$r_{St}(1-\tau_{St}) = r_{Mt}(1-\tau_{Mt}) \tag{12}$$

$$w_{St}(1-\tau_{St}) = w_{Mt}(1-\tau_{Mt}) \tag{13}$$

where τ_{Mt} is the tax rate on capital and labor income from the traditional sector and τ_{St} is the tax rate on Solow generated income. Using (12) and (13), the Solow technology negative profit condition (11) can be rewritten as

$$A_{St} \leq \frac{1-\tau_{Mt}}{1-\tau_{St}}\left[\frac{w_{Mt}}{1-\theta}\right]^{(1-\theta)} \left[\frac{r_{Mt}}{\theta}\right]^{\theta}$$

Now if Solow is not profitable, then all the economy's capital and labor are employed in Malthus. Using the profit maximizing conditions of firms using the Malthusian technology, the non-use of the Solow technology condition becomes

$$A_{St} \leq \frac{1-\tau_{Mt}}{1-\tau_{St}} A_{Mt}\left[\frac{\phi}{1-\theta}\right]^{(1-\theta)} \left[\frac{\psi}{\theta}\right]^{\theta} K_t^{\psi-\theta} N_{pt}^{\phi-(!-\theta))} \tag{14}$$

where $K_t = N_{pt}k_{pt} + N_{et}k_{et}$. As (14) shows, a higher Solow TFP or a lower Malthus TFP hastens the switch to the Solow technology. The switch to Solow is also impacted by the size of

the capital stock. If $\theta > \psi$, so that production in the modern sector is more capital-intensive than production in the traditional sector, a larger capital stock increases the incentives for using the modern technology.

3.5 Utility Maximization

A household of type j chooses consumption and bequests, as well as how to allocate its resources across the traditional and modern sectors in order to maximize utility subject to its budget constraint, $c_{jt}+n_{jt}b_{jt} \leq I_{jt}$, where I_{jt} denotes the after-tax income of household type j. While tax rates are sector specific, we allow for land rental income to be taxed at a rate different from the rate on Malthusian capital and labor income. We denote this tax rate on land rental income by τ_{Lt}. In light of the assumption regarding endowments and tax rates, the after tax income of a non-landed household in period t is

$$I_{pt} = (1-\tau_{Mt})(r_{Mt}k_{Mt} + w_{Mt}h_{Mt}) + (1-\tau_{St})(r_{St}k_{St} + w_{St}h_{St}) + tr_{pt} - (f_p + d_{pt})$$

and the income of a landed household in period t

$$I_{et} = (1-\tau_{Lt})\, r_{Lt} + (1-\tau_{Mt})\, r_{Mt}k_{Mt} + (1-\tau_{St})\, r_{St}k_{St} + tr_{et} - (f_{et} + d_{et})$$

In the above equations tr_{jt} are the transfers to a household of type j, f_{jt} and d_{jt} are, respectively, a fixed cost of lobbying and the political contributions made by a household of type j. At this stage, transfers and contributions are treated parametrically.

As utility is Cobb-Douglas, the optimal choices solve the following conditions:

$$c_{jt} = \mu I_{jt} \tag{15}$$

$$b_t n_{jt} = (1-\mu)\, I_{jt} \tag{16}$$

Substituting (15) and (16) into the utility function we obtain the following indirect utility for the non-landowners:

$$W_{pt} = \widetilde{\mu}\left[(1-\tau_{Mt})(r_{Mt}k_{Mt} + w_{Mt}h_{Mt}) + (1-\tau_{St})(r_{St}k_{St} + w_{St}h_{St}) + tr_{pt} - (f_{pt} + d_{pt})\right] \tag{17}$$

where $\widetilde{\mu} \equiv \mu^{\mu}(1-\mu)^{1-\mu}$. For the landowners:

$$W_{et} = \widetilde{\mu}\left[(1-\tau_{Lt})\, r_{Lt} + (1-\tau_{Mt})\, r_{Mt}k_{Mt} + (1-\tau_{St})\, r_{St}k_{St} + tr_{et} - (f_{et} + d_{et})\right] \tag{18}$$

3.6 Equilibrium Prices and Quantities

The relevant initial conditions for the economy are the capital stocks of landowners and non-landowners k_{p0} and $k_{e0,}$, and the measure of each household type, N_{p0} and N_{e0}. The policy, which at this stage is treated parametrically, consists of tax rates, τ_{St}, τ_{Mt} and τ_{Lt}, the transfers, tr_{pt} and tr_{et}, donations d_{pt} and d_{et}, and lobbying costs, κ_{pt} and κ_{et}. In addition, the policy may entail some government consumption, g_t.

In terms of prices and allocations, the equilibrium path for the economy constitutes a sequence of household variables $\{W_{pt}, c_{pt}, b_{pt}, W_{et}, c_{et}, b_{et}\}$, a sequence of firm allocations, $\{Y_{Mt}, K_{Mt}, H_{Mt}, Y_{St}, K_{St}, H_{St}\}$, a sequence of prices $\{w_{St}, w_{Mt}, r_{Mt}, r_{st}, r_{Lt}\}$ and a sequence of laws of motions for $\{N_{et+1}, N_{pt+1}, k_{et+1}, k_{pt+1}, l_{t+1}\}$, which satisfy

1. Utility maximization. Given the policy, prices and endowments, (c_{jt}, b_{jt}) maximizes the utility of each household type $j = e, p$, subject to its budget constraint.

2. Profit maximization of Malthusian firms. Given prices, Y_{Mt}, K_{Mt}, and H_{Mt} maximize profits of Malthusian firms

3. Profit maximization of Solow firms: Given prices, Y_{St}, K_{St}, and H_{St} maximize profits of Solow firms

4. Market clearing

    a. Goods market: $N_{et}c_{et} + N_{pt}c_{pt} + g_t + N_{et}f_{et} + N_{pt}f_{pt} = Y_{St} + Y_{Mt}$
    b. Land rental market: $L_{Mt} = N_{et}l_{et}$
    c. Capital rental market: $K_{Mt} + K_{St} = N_{et}k_{et} + N_{pt}k_{pt}$
    d. Labor market: $H_{Mt} + H_{St} = N_{pt}$

5. Laws of motion

    a. $N_{pt+1} = g_p\left(\overline{c}_t\right) N_{pt}$
    b. $N_{et+1} = g_e\left(\overline{c}_t\right) N_{et}$
    c. $k_{jt+1} = (1-\delta)\, k_{jt} + b_{jt}$
    d. $l_{t+1} = L/N_{et+1}$

4 Political Equilibrium

Having described the market side of the model, we not turn to the political economy side. There are two levels to this side of the economy. At the top, there is the decision of the elite over the polity for the economy. More specifically, at the beginning of each period, the political elite, which is comprised of the landed households, chooses between autocracy and democracy for the economy's polity. At the bottom, the ruler chooses the country's tax and transfer policy. Autocratic rulers are heterogeneous with respect to their preferences, and hence objectives. There are three types of autocrats: a good autocrat who cares about the welfare of all households, an elite autocrat who cares only about the welfare of the landed class and a bad autocrat who only cares about his own consumption. Autocratic type is a random variable. There is no heterogeneity or randomness with respect to democratic rulers. In a democracy, there is an election between a candidate from the class of landed elites and one from the working class. The class of landowners are able to lobby by making campaign contributions so as to affect the relative popularity of the candidates and the outcome of the election. In addition to paying campaign contributions, we assume that there is a fixed cost of lobbying. It is reasonable to assume that coordinating members of the lobby as well as gathering information about the candidates etc. are costly tasks. We assume that this exogenous cost is shared equally among the members of the landed lobby.

We begin from the bottom by describing how policy is determined under autocracy and democracy. This is followed by a description of the choice of polity by the economy's elites.

4.1 Policy Determination

We denote the political regime in period t by letter R_t, where R can either be A for autocracy or D for democracy.

4.1.1 Autocracy

There are three autocrat types, which we refer to as *Good*, *Elite*, and *Bad*. We denote an autocrat's type by the letter $a \in \{G, E, B\}$. Regardless of his type, an autocrat must decide the tax rates on capital and labor income from the modern sector, on capital and labor income

from the traditional sector, and on land rental income. He must also decide how much of the collected tax receipts he should keep to himself, g_t^a and redistribute back to the two types of households, tr_{et}^a, tr_{pt}^a. Thus, the policy choice of an autocrat is a six dimensional vector, $\Omega^a = (\tau_{Lt}^a, \tau_{Mt}^a, \tau_{St}^a, tr_{et}^a, tr_{pt}^a, g_t^a)$. We suppose that all tax rates are set within the range $[0, \overline{\tau}]$. Moreover, we assume that per capita transfers to each type of household must be the same.

The budget constraint of an autocrat is thus

$$g_t^a + N_{et} tr_{et}^a + N_{pt}\ tr_{pt}^a = \tau_{Lt}^a r_{Lt} L + \tau_{Mt}^a \left(r_{Mt} K_{Mt} + w_{Mt} H_{Mt}\right) + \tau_{St}^a \left(r_{St} K_{St} + w_{St} H_{St}\right)$$

Let V^a denote the objective function of autocrat a. The objective of a type a autocrat is:

$$V^a = \rho_t^a g_t^a + (1 - \rho_t^a)[\lambda_t^a W_{et} + (1 - \lambda_t^a)\, W_{pt}] \tag{19}$$

where ρ_t^a is the weight an autocrat places on his welfare versus society's, and $\lambda_t^a$is the weight he places on the welfare of the elite class versus the working class.

For the good autocrat, $a = G$, $\rho_t^G = 0$ and $\lambda_t^G = N_{et}/N_t$. Thus, autocrat G is essentially a social planner who maximizes a weighted average of household welfare, where the weights are equal to the share of each household type in the population, namely, $V^G = \lambda_t^G W_{et} + (1 - \lambda_t^G) W_{\overline{p}t}$. Given this objective, and the distortionary effects of taxes the good autocrat chooses all policies to be zero.

For the elite autocrat, $a = E$, $\rho_t^E = 0$ and $\lambda_t^E = 1$. Thus, the elite autocrat maximizes the indirect utility of a member of the elite class, i.e., $V^E = W_{et}$. Given this objective, the elite autocrat may want to impose positive taxes on certain types of income, and thus collect tax receipts. Since the elite autocrat does not gain utility from government expenditures, however, he will want to transfer all of these tax receipts back to the population. By assumption, the amount he transfers must be the same on a per capita basis for elites and workers.[3]

For the bad autocrat, $a = B$, $\rho_t^B = 1$. Thus, the bad autocrat uses all the tax revenues for government consumption. Consequently, transfers are zero under this type of political regime.

[3] For sure, without this restriction, the elite autocrat would choose to transfer all collected taxes back to the set of landed households. As a practical matter, we reason that this is infeasible as it on the grounds that it could trigger a revolt among non-landowners.

4.1.2 Democracy

Under a democracy, there is an election to determine the ruler and policy for the economy. The timing is then as follows.

1. One candidate is randomly drawn from the group of elites and one candidate from the group of workers. We use the letter $z \in \{E, P\}$ to denote the candidate's class.

2. Each candidate commits to a policy platform $\Omega_t^z = (\tau_{Lt}^z, \tau_{Mt}^z, \tau_{St}^z, tr_{et}^z, tr_{pt}^z, g_t^z)$ where $z \in \{E, P\}$.

3. The landowners, being the only group able to organize itself in a lobby, makes campaign contributions to the two candidates, thereby affecting the relative popularity of the candidates.

4. Elections are held and the winning candidate's policy, Ω_t^z, is implemented.

As in the standard Downsian framework, we assume that under democracy each candidate obtains some ego rents from winning the election. These rents are not included in the policy maker's budget constraint. Each candidate sets his policy in order to maximize the probability of winning the election.

We need to identify the swing voter in each group and establish how campaign contributions affect each candidate's probability of winning the election by shifting relative popularity from one candidate to the other. Let $W_{jt}(\Omega_t^c)$ denote the indirect utility of a voter of type $j = e, p$ as a function of the policy associated with candidate $z = E, P$. The ideological preference of voter i of type j is a random variable, denoted σ_{ij} and uniformly distributed on $[-1/2\eta, 1/2\eta]$. Voters in the two groups have identical ideological preferences for candidates E and P which implies that the support of σ_{ih} is the same for the two household groups. A voter in group j prefers candidate E if

$$W_{jt}\left(\Omega_t^E\right) > W_{jt}\left(\Omega_t^P\right) + \sigma_{ij} + \kappa \tag{20}$$

where κ is a parameter capturing the relative popularity of candidate P in the population as a whole. This parameter can be positive or negative and is affected by campaign contributions

according to the following equation:

$$\kappa = \widetilde{\kappa} + \beta \left(D_t^P - D_t^E \right)$$

where D^z denotes aggregate campaign contributions received by candidate z, $\beta > 0$ is a parameter that determines the affect of contributions on a candidate's popularity, and $\widetilde{\kappa}$ is a parameter that represents the inherent relative popularity of candidate P.

In light of our assumption on ideological preferences, the relative popularity of candidate E is uniformly distributed on $[-1/2\varphi, 1/2\varphi]$. The swing voter in group j is by definition indifferent between candidates P and E so that (20) holds with equality, i.e.

$$\sigma_h = W_j \left(\Omega_t^E \right) - W_j \left(\Omega_t^P \right) + \beta \left(D_t^E - D_t^P \right) - \widetilde{\kappa} \tag{21}$$

Clearly, all voters with $\sigma_{ih} \leq \sigma_h$ prefer candidate E to candidate P. Let α_{jt} denote the relative size of sector j, i.e. $\alpha_{pt} = N_{pt}/N_t$ and $\alpha_{et} = N_{et}/N_t$. This implies that the vote share of candidate E, χ^E, is given by:

$$\chi^E = \sum_j \alpha_{jt} Prob \left(\sigma_{ih} \leq \sigma_h \right)$$

By the uniform distribution of σ_{ih}, $Prob \left(\sigma_{ih} \leq \sigma_h \right) = \eta \left(\sigma_h + 1/2\eta \right)$ which implies that candidate E:s share of votes may be written:

$$\chi^E = \eta \sum_j \alpha_{jt} Prob \left(\sigma_h + \frac{1}{2\eta} \right)$$

Since the threshold value for the swing voter, σ_h, depends on the stochastic parameter $\widetilde{\kappa}$ according to (21), the vote share χ^E is a stochastic variable. The probability of candidate E winning the election as a function of the campaign contributions is thus:

$$\pi^E = Prob \left(\chi^E \geq 1/2 \right) = Prob \left(\eta \sum_j \alpha_{jt} \sigma_h \geq 0 \right)$$

since $\sum_j \alpha_{jt} = 1$. Substituting for σ_h implies:

$$\pi^E = \frac{1}{2} + \varphi \left(W \left(\Omega_t^E \right) - W \left(\Omega_t^P \right) + \beta \left(D_t^E - D_t^P \right) \right) \tag{22}$$

where $W(\Omega^z) = \sum_j \alpha_{jt} W_j(\Omega_t^z)$ is the utilitarian social welfare function and $D_t^E = \alpha_{et} d_{et}$. The probability that candidate E wins the election is increasing in the social welfare associated with the candidate's platform and in campaign contributions D_t^E.

Next, consider the optimal contributions of the landowners. We assume that landowners are organized in one single lobby, seeking to maximize the expected utility of its members subject to a cost function. In addition to the fixed costs of lobbying, the cost function is assumed to be quadratic in campaign contributions. The lobby can contribute to both candidates' campaigns and decides on d_{et}^E and d_{et}^P i.e. how much each member of the lobby must contribute to each of the two candidates:

$$\max_{d_e^E, d_e^P} \pi^E W_e\left(\Omega_t^E\right) + \left(1-\pi^E\right) W_e\left(\Omega_t^P\right) - f_{et} - \frac{1}{2}\left[\left(d_{et}^E\right)^2 + \left(d_{et}^P\right)^2\right]$$

subject to (22), taking the platforms Ω_t^E and Ω_t^P and the fixed cost x_{et} as given. The first-order conditions imply:

$$\begin{aligned} d_{et}^E &= \max\left\{0, \alpha_{et}\varphi\beta\left[W_e\left(\Omega_t^E\right) - W_E\left(\Omega_t^P\right)\right]\right\} \\ d_{et}^P &= -\min\left\{0, \alpha_{et}\varphi\beta\left[W_e\left(\Omega_t^E\right) - W_E\left(\Omega_t^P\right)\right]\right\} \end{aligned} \tag{23}$$

The elite lobby therefore chooses to contribute only to the campaign of candidate E as long as $W_e\left(\Omega_t^E\right) - W_e\left(\Omega_t^P\right) > 0$.

The two candidates anticipate that landowners, but not other subgroups within society will be able to organize themselves in a lobby. They also internalize that the lobby will choose contributions according to (23). Therefore, both candidates will converge to the same policy platform. Both candidates are willing to choose their platforms such that they maximize their probability of winning the election, and when landowners are is the only ones making campaign contributions, both candidates aim to please that group.

Recall that candidates maximize the probability of being elected. From (23) we know that only candidate E will receive contributions. Using the definition of the social welfare functions in (22), substituting for equilibrium contributions (23), using the fact that $D_t^E = \alpha_{et} d_{et}^E$ and simplifying we obtain:

$$\pi^E = \alpha_{et}\left(\varphi + (\varphi\beta)^2\right) W_e\left(\Omega_t^E\right) + \varphi\left(1-\alpha_{et}\right) W_p\left(\Omega_t^E\right) + \Psi(\Omega_t^P)$$

where $\Psi(\Omega_t^P) = 1/2 - \varphi(\alpha_{et} W_e(\Omega_t^P) + (1-\alpha_{et}) W_p(\Omega_t^P) + \alpha_{et} (\varphi\beta)^2 W_e(\Omega_t^P))$. Letting Λ denote the objective function of the policy maker we may write the problem of candidate E as

$$\max_{\Omega_t^E} \Lambda^E = \alpha_{et} \left(\varphi + (\varphi\beta)^2 \right) W_e \left(\Omega_t^E \right) + \varphi \left(1 - \alpha_{et} \right) W_p \left(\Omega_t^E \right)$$

taking Ω_t^P as given and where indirect utility is given by (17) and (18). Since both candidates will choose the same platform, $\Omega_t^E = \Omega_t^P \equiv \Omega_t^D$, we may write

$$\Omega_t^D = \left(\tau_{Lt}^D, \tau_{Mt}^D, \tau_{St}^D, tr_{et}^D, tr_{pt}^D, g_t^D \right) = \arg\max \Lambda^E \tag{24}$$

subject to the budget constraint:

$$N_{et} tr_{et}^D + N_{pt} tr_{pt}^D = \tau_{Lt}^D r_{Lt} L + \tau_{Mt}^D \left(r_{Mt} K_{Mt} + w_{Mt} H_{Mt} \right) + \tau_{St}^D \left(r_{St} K_{St} + w_{St} H_{St} \right)$$

where tr_{ht}^D are transfers under democracy. As in the case of autocracy, transfers must be the same on a per capita basis between landed and non-landed households. Since both candidates choose the same platform, (23) implies that equilibrium campaign contributions in this model are zero. It is simply the presence of the landed lobby that brings about their desired policy in democracy. However, since there is an exogenous cost of coordinating the lobby, democracy always implies a cost to the political elite per member equal to $f_{et} = F/N_{et}$.

4.2 The Decision of the Elite

Having described the optimal policy choices under autocracy and democracy, we next turn to the decision of the elites over the nation's political regime. This decision is made at the start of each period. We assume that democratization is a final decision. Thus, once the elite choose to democratize, the economy stays with that political regime in all future periods.

Let Π^a denote the probability of drawing an autocrat of type a. The elites choose democracy if:

$$W_{et}^D \left(\Omega_t^D \right) > \sum_a \Pi^a W_{et}^a \left(\Omega_t^a \right) \tag{25}$$

where W_{et}^a is determined by (18).

5 Equilibrium

With the extra layer to the economy, we must add the following elements to the definition of an equilibrium for our economy: polity type and lobbying cost per member of elite $\{R_t, f_{et}\}$, autocrat type a_t in the case when $R_t = A_t$ and a policy $\{(\tau^z_{Lt}, \tau^z_{Mt}, \tau^z_{St}, tr^z_{et}, tr^z_{pt}, g^z_t)_{z\in Z}\}$. Here we use Z to denote the set of all possible rulers, namely, a good, elite, and bad autocrat, and an elite democrat and a worker democrat. Additionally, we must add the following two conditions to the equilibrium conditions stated earlier regarding the market side of the economy. These two conditions are:

1. The elite choose political regime R_t according to (25).

2. The policy $(\tau^z_{Lt}, \tau^z_{Mt}, \tau^z_{St}, tr^z_{et}, tr^z_{pt}, g^z_t)$ maximizes the objective of the policy maker implied by the elites' choice of political regime.

6 Numerical Experiments

We now illustrate the equilibrium properties of the model via a set of numerical experiments. Since individuals have one-period lives, the solution reduces to a sequence of static problems. We conduct two sets of experiments. In the first, we assume that the political regime is given and is the same in every period. Hence, autocratic type is not stochastic and the landed elite do not choose the type of political regime. The point of shutting down these elements is to illustrate how polity affects economic performance. The second experiment reintroduces these elements so that the political regime is chosen by the landed elite and autocratic type is a random variable. The point of this second set of experiments is to examine how economic development feedbacks to political development.

6.1 Parameters

As we solve the equilibrium numerically, we first assign values for the parameters. For the technology parameters, we use the values assigned by Hansen and Prescott (2002). The Hansen and Prescott Malthusian capital share value ψ is .10, the Malthusian technology labor share

parameter ϕ is .60, and the calibrated Solow technology capital share θ is .40. We normalize TFP for the Malthus technology in the initial period to 1.0. For Solow TFP, we assign a value so that when polity is fixed, each economy starts out in a state where it is unprofitable to employ it. We set the value of the growth rate of TFP in the Solow technology, γ_S, to match the average annual growth rate of US per capita GDP of 2 percent, and the value of the growth rate of TFP in the Malthus technology γ_M, to match the average annual growth rate of the population of the world prior to 1700 of .3 percent per year. The value of γ_M can be tied down from this observation because the growth rate of the population in the model where only the Malthus technology is used is equal to $\gamma_M^{1/(1-\phi-\psi)}$.

The additional parameters of the model are the initial population that belongs to the class of landed elites, N_{e0}, the initial population that belongs to the working class, initial capital stocks for both type of households, k_{e0} and k_{p0}, the income share preference parameter on consumption and bequests in household utility, μ, and the political economy variables φ, β,Π^G, Π^B, κ ,F_e. Without loss of generality we set the total initial population to 1.0 and assign 5 percent of the population to the set of the ruling landed class. This percent is in line with estimates on land holdings in Latin America prior to its independence. The initial capital stocks are chosen so that the each economy starts in more or less of a Malthusian steady state so that the capital stock per household is the same between periods 1 and 2 and set $k_{e0} = k_{p0} = .1$. The weight on consumption in household preferences, μ, is set to .7. As for the political parameters, we set $\varphi = 2.5$ and $\beta = 2$. The results are not sensitive to these values. The fixed cost of lobbying per landed elite is set equal to .5. For the probability of drawing a bad autocrat, we assume that the probability is constant and equal to that of drawing a good autocrat: $\Pi^B = \Pi^G = .10$. We set an upper bound for tax rates at .7.

Lastly for the population growth functions we assume that $g_e(\overline{c}_t) = g_p(\overline{c}_t)$. Thus, the fraction of the population that is part of the elite class and the worker class is constant in these experiments. The exact population growth function is shown in Figure 4.

6.2 The Effect of Polity on Performance

We begin by removing the randomness over autocrat type and the choice of political regime by the landed elite. What we do is determine the equilibrium path for four economies, each with a different ruler type that does not change over time. Each economy starts out with the same amount of aggregate capital and the same distribution of capital between landed and non-landed household types. While the landed elite do not choose the political regime for the economy, they do in the case of democracy lobby the candidates to affect the outcome of the election and hence incur the fixed cost f_{et}.

Figures 5 and 6 document the paths of per capita capital and GDP, respectively, for each of the four economies over the first 12 periods.

Figures 5 and 6 here

In terms of per capita capital, democracy is clearly a middle ground. A good autocracy is by far the polity that is associated with the greatest wealth. The capital stock in the elite autocracy economy closely follows the capital stock in the democratic economy in the first eight periods, but thereafter is lower. The bad autocracy is by far the worst in every period. In terms of per capita output, Figure 6 suggests that good autocracy is clearly the best regime and that democracy again represents a middle ground. In the short run, elite autocracy performs worse than the bad autocracy but in the long run, bad autocracy is again the worst system.

To better understand these results, we report the optimal tax rates chosen in each period under the four separate types of policy makers. These are reported in Table 1 along with the equilibrium allocations to the Malthus sector. We also indicate whether the Solow technology is used in a period in each of the four economies. We also report in Table 2 the capital stock owned by each household type as well as their income.

Tables 1 and 2 here

As shown in column 1 of Table 1, each economy starts out in the Malthusian era, i.e. in a state where only the Malthusian technology is used. Recall that the profitability of the Solow technology is increasing in the aggregate capital stock and even without any intervention from

policy makers, each economy will modernize eventually as the capital stock grows. However, the policy maker in power may affect the profitability of the modern technology and may therefore expedite or delay industrialization by setting tax rates accordingly.

The results that pertain to an economy ruled by a good autocrat are easy to understand. As Table 1 shows the good autocrat sets all tax rates to zero for the first four periods. This is not surprising as his objective is to maximize aggregate welfare in the economy. In period five, it is optimal for the good autocrat to industrialize, and he temporarily increases the tax on Malthusian income to .4 in order to increase the relative profitability of the Solow technology. Once the economy is modernized, from period 6 onwards, the good autocrat again sets all tax rates to zero.

In contrast to the good autocrat, the bad autocrat seeks to maximize tax revenue and therefore typically sets all tax rates to their upper bounds, 0.70.[4] Since the capital stock is lower in bad autocracy than in good autocrat, modernization occurs later, in period six. The autocrat achieves this by temporarily lowering the Solow tax rate to .6. Once industrialized, the bad autocrat sets all tax rates at their upper bounds throughout the modern era.

The outcomes under good and bad autocracy, and in particular the timing of industrialization in the absence of distortive taxation, serve as useful benchmarks against which to evaluate the performance of the elite autocracy and democracy. Contrary to the good and bad autocracies, the elite autocrat and the democrat distort the allocation of resources by taxing Solow and Malthus at different rates. Not surprisingly, the elite autocrat and the democrat seek to postpone industrialization as they care relatively more about landowners than the landless class. They therefore delay the implementation of the modern technology by means of distortive taxation. When comparing the elite autocracy to the democracy, the results in Table 1 show that the in the elite autocracy, modernization occurs one generation later than

[4] During the Malthusian era, the Solow sector generates no income since it is not in use. Therefore, as long as the tax rate on Solow does not affect the profitability of the modern technology, there exists an interval of tax rates on Solow that yield the same outcome and utility to the policy maker. For instance, in periods 1 and 2, the bad autocrat can tax Solow at any rate $\tau_S \in [0, .7]$. In period 3, he may set $\tau_S \in [.3, .7]$ and in period 4 $\tau_S \in [.5, .7]$. Since it is always optimal to tax Solow at the upper bound in this era, in what follows we will only report this outcome and refer to this as the optimal choice of the bad autocrat. The same applies to the results for elite autocracy and democracy: during the pre-industrialization era, the policy maker in power may be indifferent between taxing Solow at the upper bound or at a lower rate, but for the sake of simplicity we choose not to make this distinction in the analysis.

the modernization in the democracy. The reason is that while both groups assign a larger weight to landowners than to other households, the democrat assigns a smaller weight to the landed elite than does the elite autocrat. In other words, the more the policy maker cares about the elite, the later he chooses to industrialize.

Consider the choices of the elite autocrat. Not surprisingly, he taxes land at zero rate in all periods. For the first four periods, the elite autocrat taxes both Malthusian income and Solow income at the upper bound. Since only the Malthus technology is in use, all income derives from this sector. At first it may seem that taxing Malthus should harm landowners and indeed it does, since it reduces their capital income. However, since tax revenue is returned as transfers, it also generates some income to landowners. In addition to generating tax receipts also from capital held by the non-elite, taxing Malthus generates income from labor. Since it is only the landless class who work in this economy, the latter channel generates benefits to landowners via transfers without harming them. For an economy at a low level of development, i.e. with a small capital stock, labor income is likely to be a more important source of tax revenue than capital, and it therefore seems that the benefits to the elite of taxing Malthus outweigh the costs at the start of the Malthusian era. As the economy develops, the benefits of taxing Malthusian income to the elite autocrat decreases precisely because the capital stock is greater and the taxes on capital paid by the landed elite become relatively more important. The elite autocrat consequently lowers the tax on Malthusian income to .6 in period six and in the subsequent period to .4. In period eight, the Solow technology has become so profitable that even the elite autocrat chooses to modernize, and does so by setting all tax rates to zero. As the economy develops even more, by period eleven the capital stock has become so large that the Elite autocrat may raise the tax on Solow and yet maintain the profitability of the modern sector. He therefore taxes Solow income at the upper bound for the rest of the modern era.

The evolution of the democracy is very similar to that of the elite autocracy. In fact, the optimal policy of the democratic leader is identical to that of the elite autocrat for the first six periods. However, since the democratic leader assigns some weight also to the landless class, he chooses to industrialize the economy one generation before the elite autocrat, i.e. in period

seven. Since this regime switch occurs at a different level of development, it is consistent with a slightly different combination of tax rates than in elite autocracy: the democrat industrializes by setting all tax rates to zero. As the economy develops post-industrialization, the democratic leader may raise the tax on Malthusian income to .2 and the tax on Solow income to the upper bound while maintaining the profitability of the new technology.

Having established how the different types of policy makers act over time, let us revisit the performance of these economies in terms of wealth, income and equality as reported in Table 2 and Figures 5 and 6. As mentioned above, the good autocracy outperforms the democracy and the elite autocracy both in terms of capital and GDP per capita. Although the elite autocracy and the democracy evolve similarly, the elite autocracy ends up on a less beneficial path of development than the democracy due to the delayed industrialization. Bad autocracy is by far the worst polity on all accounts. Democracy is therefore clearly a middle ground for growth and development in an economy with vested interests groups that successfully lobby their preferred policy.

While it is hardly surprising that elite autocracy and democracy follow each other closely over time, the fact that they are fairly close to the good autocracy in this experiment suggests that taxes affect the economy primarily through their distortive effects rather than their negative effects on income. This makes sense since the elite autocrat and the democratic leader return the taxes as transfers to households and negative effects of taxation on income are therefore mitigated.

Another interesting comparison between the four economies relates to the distribution of wealth. The elite autocracy generates the highest wealth disparity with a ratio of landed to non-landed capital per person of 1.36. The most even wealth distribution is somewhat surprisingly obtained in the bad autocracy where the corresponding ratio is 1.02, closely followed by democracy at .93. The ratio of landed-to non-landed capital in the good autocracy is .69. The reason wealth disparity is so high in the elite autocracy is because this autocrat is the last of the four to industrialize. This implies that the landed elite have accumulated substantial wealth when the economy enters the modern growth era.

The logic behind the results for the wealth distribution translate to the income distribution.

The elite autocracy generates the most even income distribution with a ratio of elite to non-elite income of .85. In the bad autocracy the ratio is .39, in democracy .36 and in the good autocracy income is unevenly distributed with a ratio of .27. In order to understand these results, consider the evolution of income of the two groups of households over time. During the Malthusian era, landowners are the richest group of households. In the Malthus-only state of development, landowners derive a large share of their income from renting land to firms. However, as the economy industrializes and land becomes relatively less important, so does this source of income to landowners. Non-landowners, on the other hand, derive increasingly more income from labor as labor becomes a key factor of production. In all four economies, landowners therefore have the highest income in the short run while non-landowners have the highest income in the long run. However, since the elite autocrat seeks to maximize the utility of landowners, he makes sure that landowners do not lag behind non-landowners that much, even in the modern growth era. Therefore, the elite autocrat generates the most even income distribution by making sure that landowners obtain the highest income possible although land is essentially useless in the long run.

6.3 The Effect of Performance on Polity

We now allow for autocrat type to be a random variable and let the landed elite choose whether to democratize. The main finding of these experiments is that the economy will democratize eventually, but the timing of democratization, and whether it occurs before or after industrialization, depends on the realizations of the autocrat draws. The results for different realizations of the autocrat draw are reported in Tables 3a-c.

Table 3a reports the outcomes in an economy that draws an elite autocrat in each period. In this experiment, the economy industrializes in period 8 but does not democratize until period 11. As explained in the previous section, it is optimal for the elite autocrat to ensure that the new technology is used from period eight onwards by setting all tax rates to zero. Once industrialized, the country remains autocratic for two more periods and continues to draw elite autocrats in periods nine and ten. However, in period eleven, when the cost associated with the risk of drawing a bad autocrat has become sufficiently large, the political elite choose to

democratize. The country now enters a period of modern growth and a democratic regime.

To understand this political development, we report the expected utility of a member of the elite group in each period associated with democracy and autocracy in Table 3a and graph these statistics in Figure 7a.

Tables 3a-c here

Figures 7a-c here

Recall that if the expected utility of democracy is greater than the expected utility of autocracy in each period, the political elite has the power to democratize the country. Democracy is not beneficial to the elite until the country has industrialized and accumulated enough capital. In effect, democracy has to wait until capital becomes a more important source of revenue to the elite class than land.

The case when every autocrat drawn is of the elite type serves as a useful benchmark for the following reason. If the political elite eventually chooses to democratize when the incumbent autocrat is of the type that maximizes their utility, they will choose to democratize also when the incumbent autocrat is of another type.

Next, consider the case when the political elite is less fortunate in the random draw. Table 3b reports the outcome when the economy draws an elite autocrat for the first two periods but then draws bad autocrats for the remainder of the non-democratic era. The expected utility associated with each polity is depicted in Figure 7b. The results suggest that having a history of bad autocrats speeds up the process of democratization: the political elite now choose to exit autocracy in period seven. When studying the sequence of events in this experiment two additional observations stand out. First, democratization occurs before industrialization. Second, if democracy were reversible it would not be sustained. Figure 7b suggests that, given the option, the political elite would choose to exit democracy in period eight, stay autocratic for the next two generations and then permanently democratize in period 11. The reason is that the democratic leader chooses to modernize the economy in period 8 which causes a huge drop in the utility of the political elite. However, as the elite autocrat would industrialize in period nine, autocracy becomes increasingly less favorable to the elite and the expected utility of democracy again exceeds that of autocracy from period 11 onwards.

Finally, Table 3c reports an experiment where the economy draws an elite autocrat for the first two periods and good autocrats throughout the rest of the non-democratic era. However, since the evolution under good autocracy and elite autocracy follow each other closely (See Table 2) this does not affect the main result from Table 3a. This economy also democratizes post-industrialization, in period 11.

To conclude, the numerical experiments with endogenous regimes generate some interesting results. First, regardless of the autocrat draw, the political elite will democratize when they have grown sufficiently rich. Second, democratization may occur before or after industrialization depending on the realization of the autocrat draw. Third, if reversible, democracy is not necessarily a stable regime if implemented at a low level of development, i.e. pre-industrialization.

7 Conclusions

We have presented a theoretical model consistent with key empirical observations on the relationship between political regimes and economic performance. The model accounts for the coevolution of development and political regimes as the choice of polity is endogenous. By introducing an explicit political equilibrium into the framework of Hansen and Prescott (2002) we are able to study the incentives of the political elite during different stages of development. Specifically, we study how the incentives to modernize the economy differ across political regimes and, simultaneously, how industrialization affects the process of democratization.

The model rests on the following ideas. First, we allow for autocrats to differ in their objectives and are thereby able to address the heterogeneous performance of autocracies. Second, special interest groups striving to keep new technologies from being implemented are able to lobby such an outcome in a democracy. Third, the incentives to adopt a democratic regime grow stronger as the economy develops since the cost of drawing a bad autocrat, seeking to expropriate wealth, is increasing in the capital stock.

We show that democracy is a middle ground for growth and development. In the presence of vested interest groups able to organize themselves in a lobby, democracy constitutes an environment that is detrimental to development by preventing the implementation of new

technologies. A good autocrat who maximizes aggregate welfare can therefore outperform a democracy, but democracy is by far a better polity than bad autocracy or an autocratic regime where the policy maker is acting in accordance with the interests of the landed elite. This result is consistent with the heterogenous performance of autocracies present in the data: while old autocracies tend to be poor and underdeveloped, the majority of the growth miracles were in fact non-democratic at the time they began to prosper.

A key implication of the model is that the incentives to democratize are contingent on the level of development. When the cost associated with the prospect of drawing a bad dictator becomes sufficiently large, the political elite will choose democracy although this regime is costly to them. We show that the realization of the autocrat draw matters for the timing of democratization. Moreover, if the economy democratizes while still at a low level of development, democracy is not necessarily stable. Prior to modernization, the political elite may have incentives to exit democracy when it becomes clear to them that the democratic leader wishes to make the modern technology profitable. For higher levels of development, when also the elite prefer to use both technologies, no such incentive exists. A democratic regime implemented post-industrialization is therefore permanently sustainable.

References

[1] Acemoglu, D., Johnson, S., Robinson, J.A. and Yared, P. (2008), "Income and Democracy", *American Economic Review*, Vol. 98, No. 3, pp. 808-842

[2] Aghion, P., Alesina, A. and Trebbi, F. (2007), "Democracy, Technology and Growth", Harvard Institute of Economic Research Discussion Paper No. 2138, Harvard University

[3] Alston, L.J. and Gallo, A.A. (2007), "Electoral Fraud, the Rise of Peron and Demise of Checks and Balances in Argentina", University of Colorado

[4] Barro, R., (1996), "Democracy and Growth", *Journal of Economic Growth*, Vol. 1, No. 1, pp. 1-27

[5] Besley, T. and Kudamatsu, M. (2007), "Making Autocracy Work", CEPR Discussion Paper, No. 6371, CEPR, London

[6] Hansen, G.D. and Prescott, E.C. (2002), "Malthus to Solow", *American Economic Review* 92, pp. 1205-17.

[7] Krusell, P. and Rios-Rull, V. (1996), "Vested Interests in a Positive Theory of Stagnation and Growth", *Review of Economic Studies* 63, pp. 601-31

[8] Mau-Kei, C. (2004), "Taiwan's Democratic Movement and Push for Independence", International Institute for Asian Studies Newsletter, Universiteit Leiden (July 2004): 11

[9] Olson, M. (1982), *The Rise and Decline of Nations: Economic Growth, Stagflation, and Social Rigidities*, Yale University Press

[10] Paltseva, E. (2008), "Autocracy, Devolution and Growth", University of Copenhagen

[11] Persson, T. and Tabellini, G. (2000), *Political Economics: Explaining Economic Policy*, MIT Press, Cambridge, MA

[12] Persson, T. and Tabellini, G. (2007), "Democratic Capital: The Nexus of Political and Economic Change", Institute for International Economic Studies, Stockholm University

[13] Sokoloff, K.L and Engerman, S.L (2000), "Institutions, factor endowments, and paths of development in the New World", Journal of Economic Perspectives 14 (3), pp. 217-232

Figures

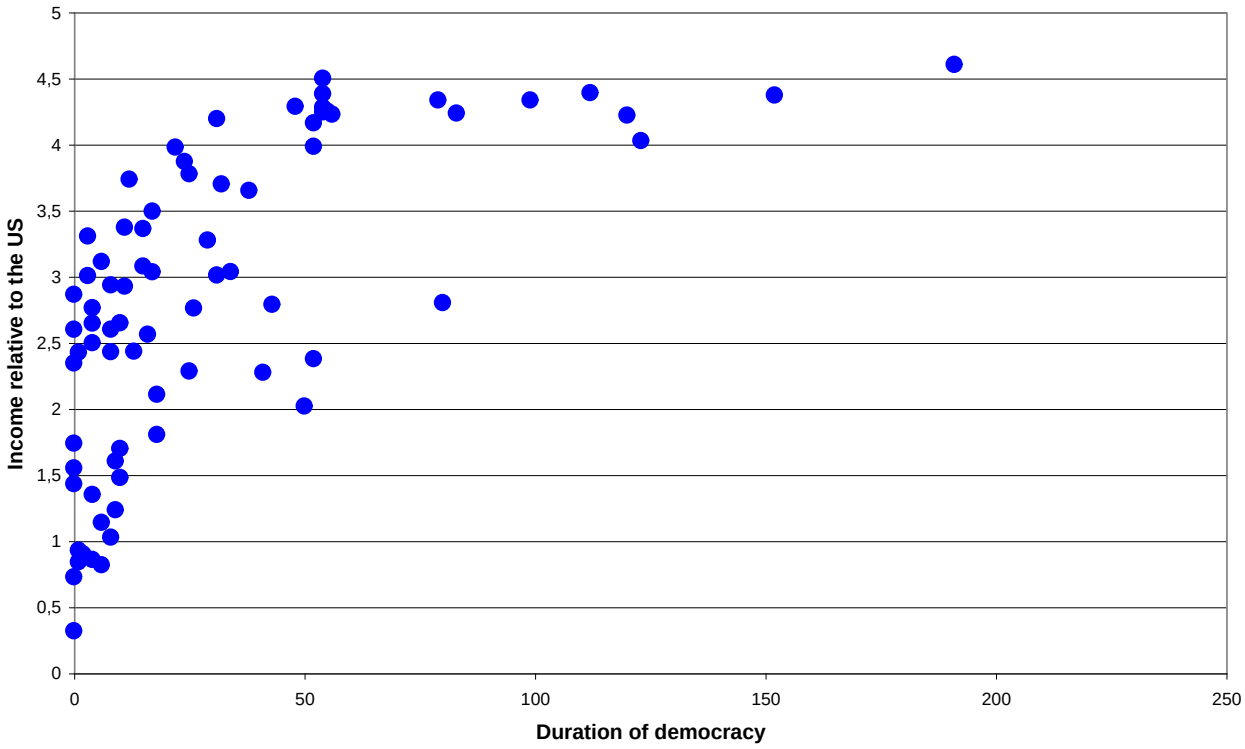

Figure 1: 2000 CGDP vs length of democracy.

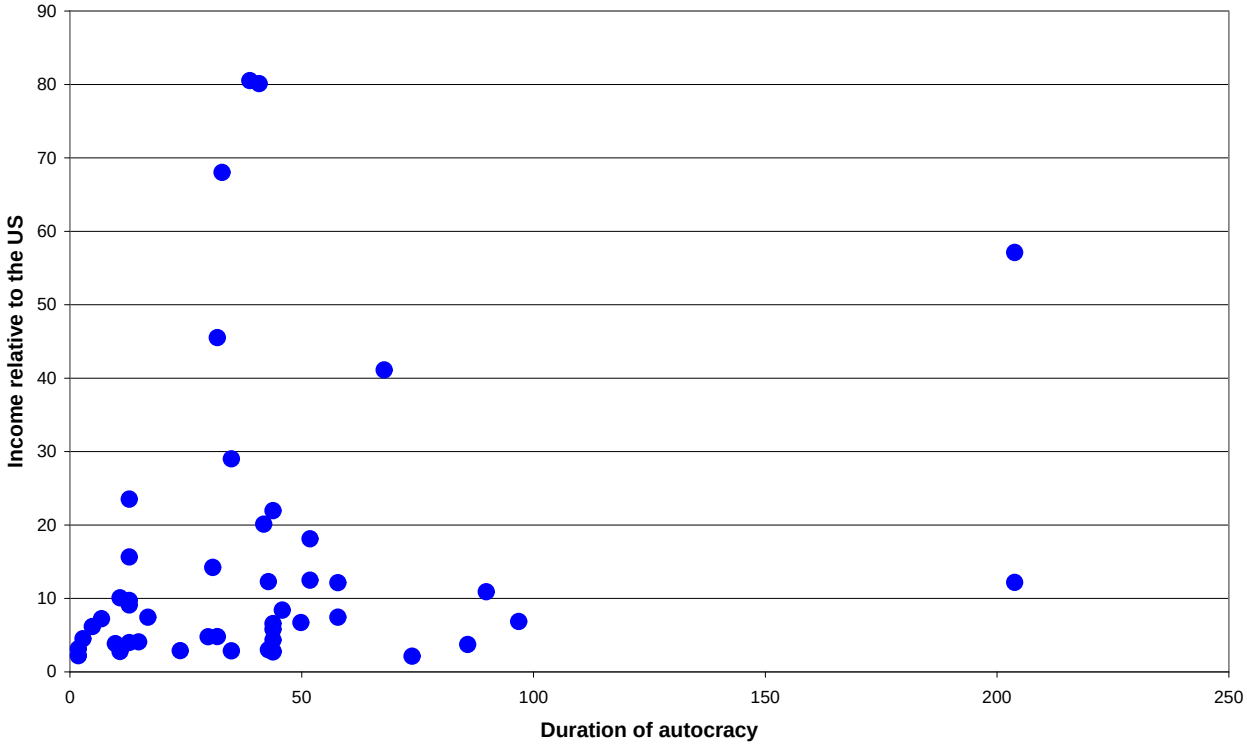

Figure 2: 2000 CGDP vs length of autocracy.

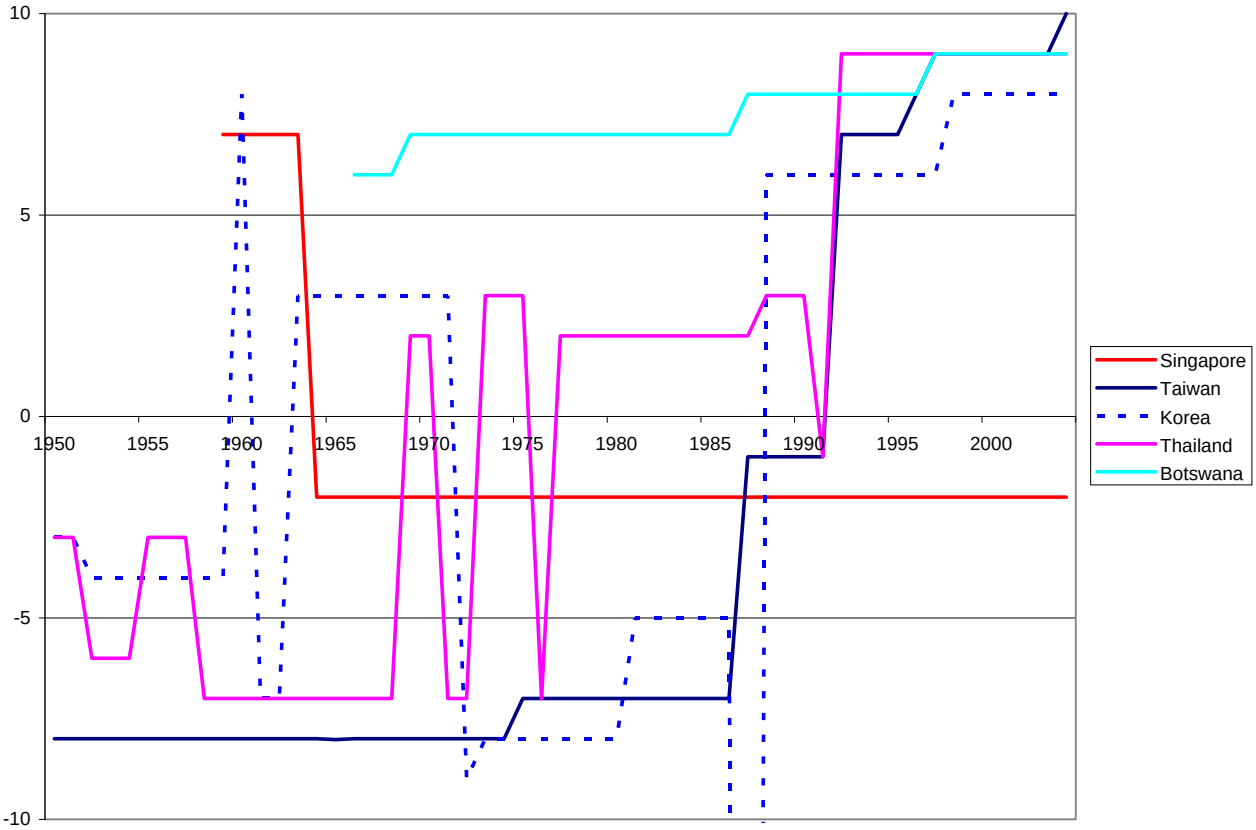

Figure 3: Polity indices of the five fastest growing economies 1960-2004.

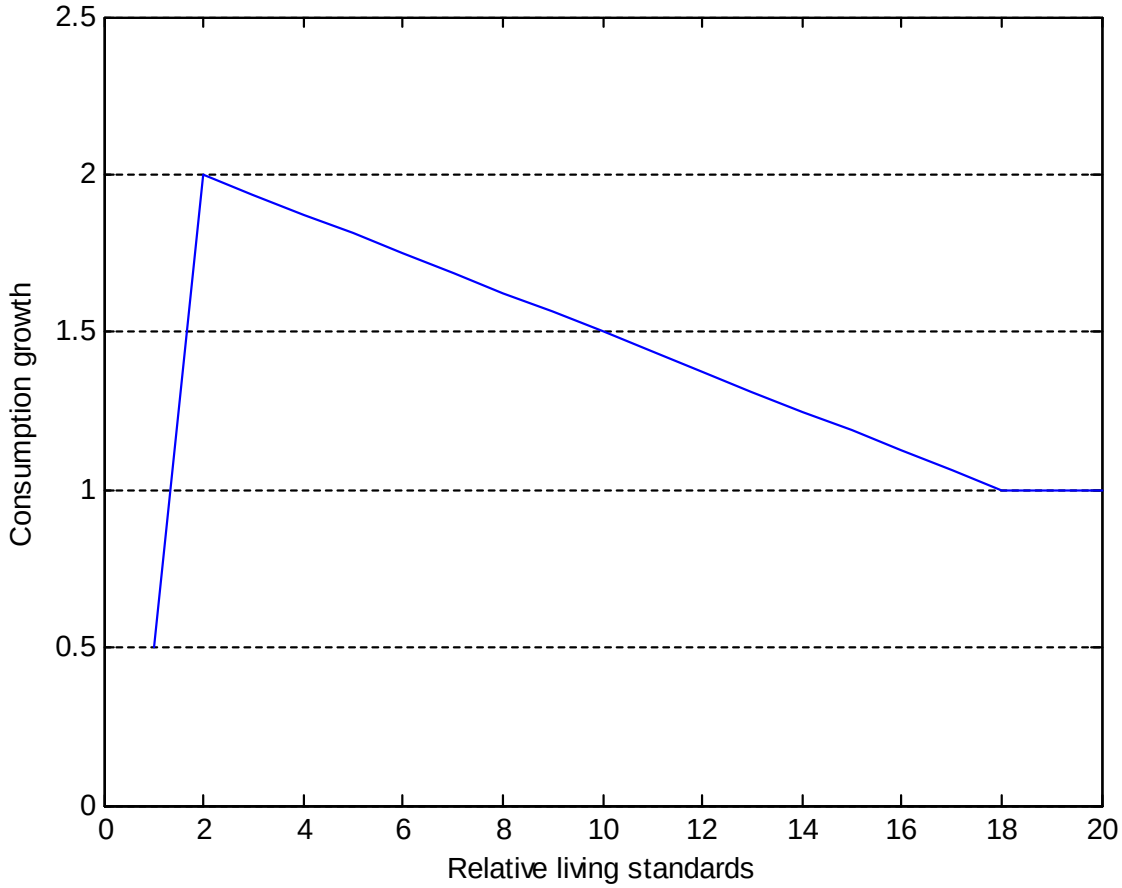

Figure 4: The Hansen-Prescott population growth function.

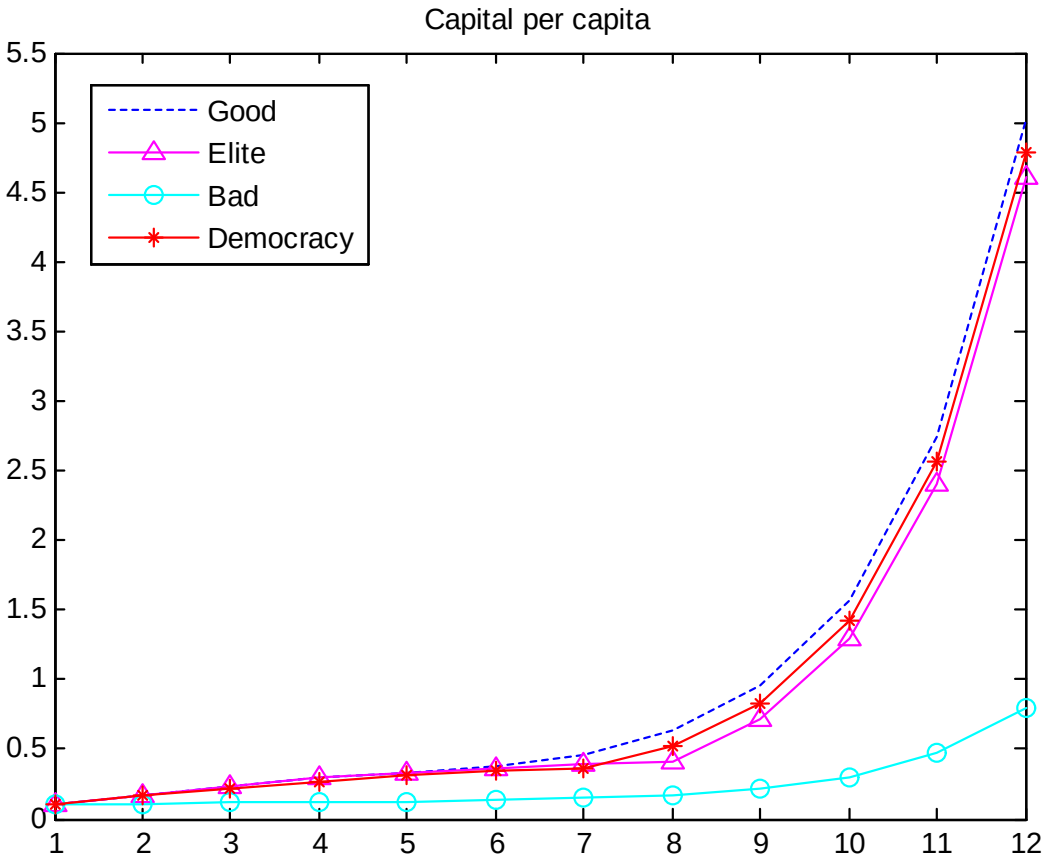

Figure 5: The evolution of capital per capita under alternative political regimes.

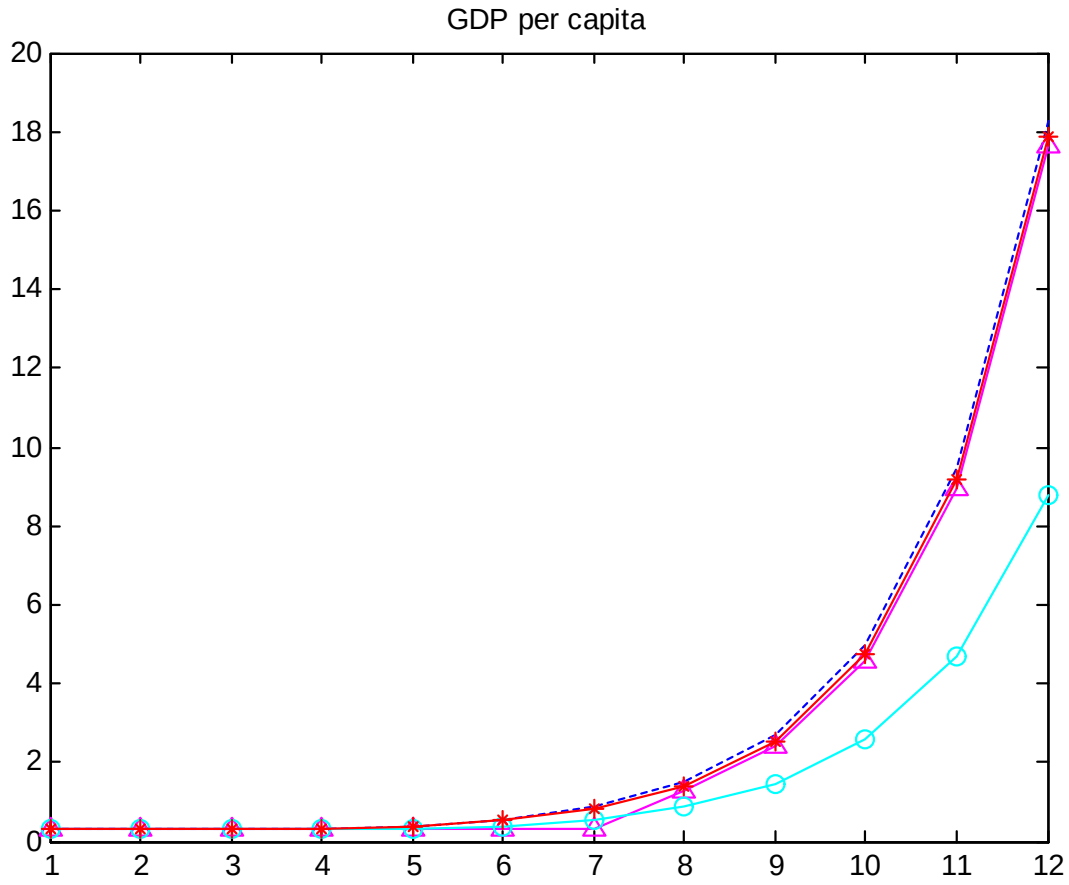

Figure 6: The evolution of GDP per capita under alternative political regimes.

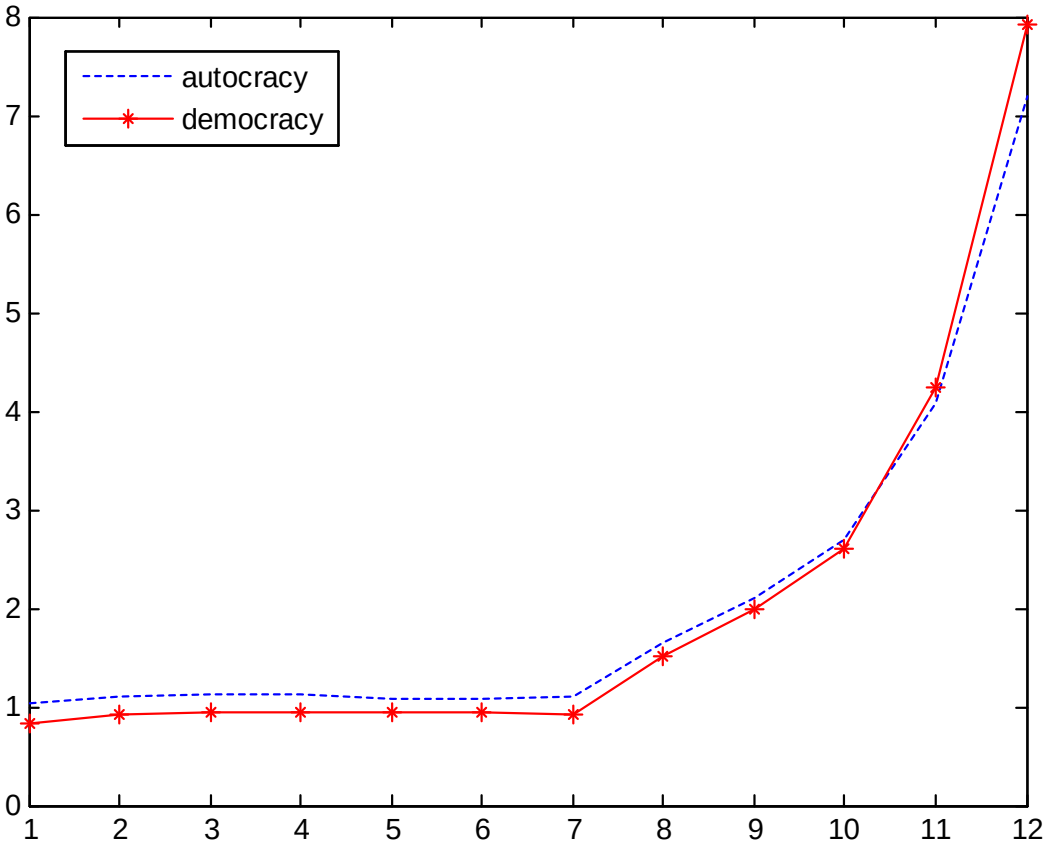

Figure 7a: Expected utility of the Political Elite in autocracy and democracy.
Autocrat draw as in Table 3a.

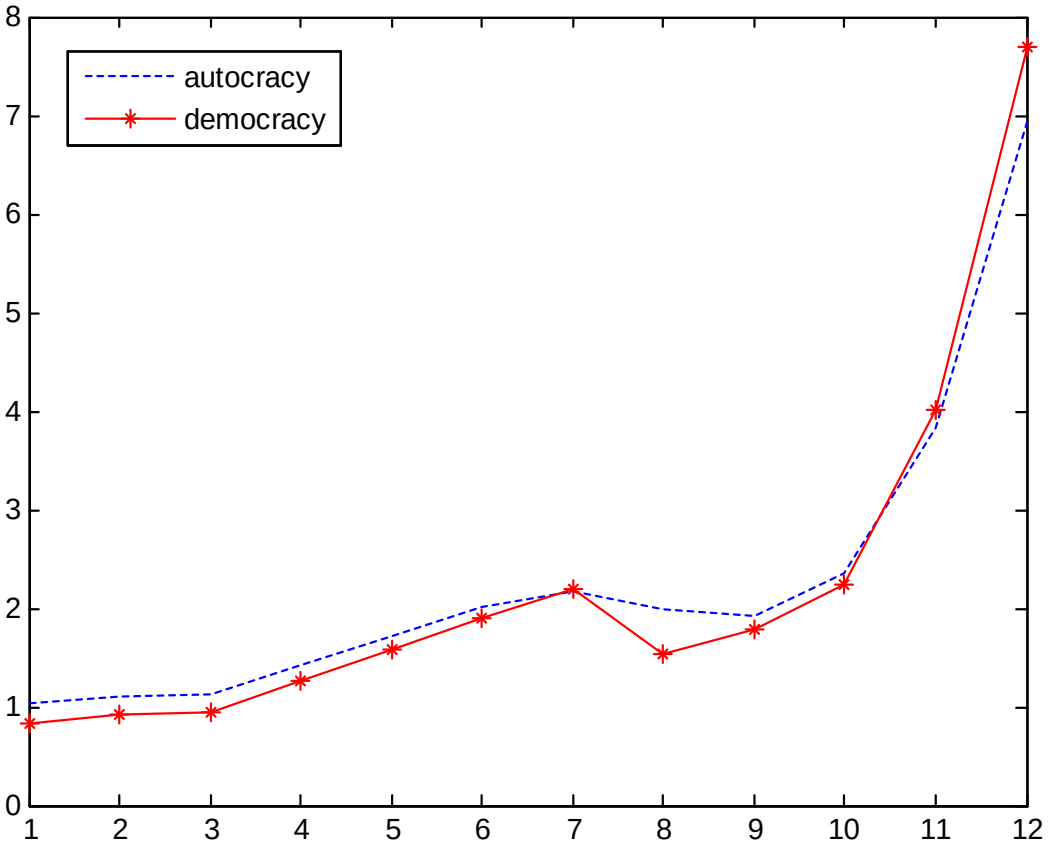

Figure 7b: Expected utility of the Political Elite in autocracy and democracy.
Autocrat draw as in Table 3b.

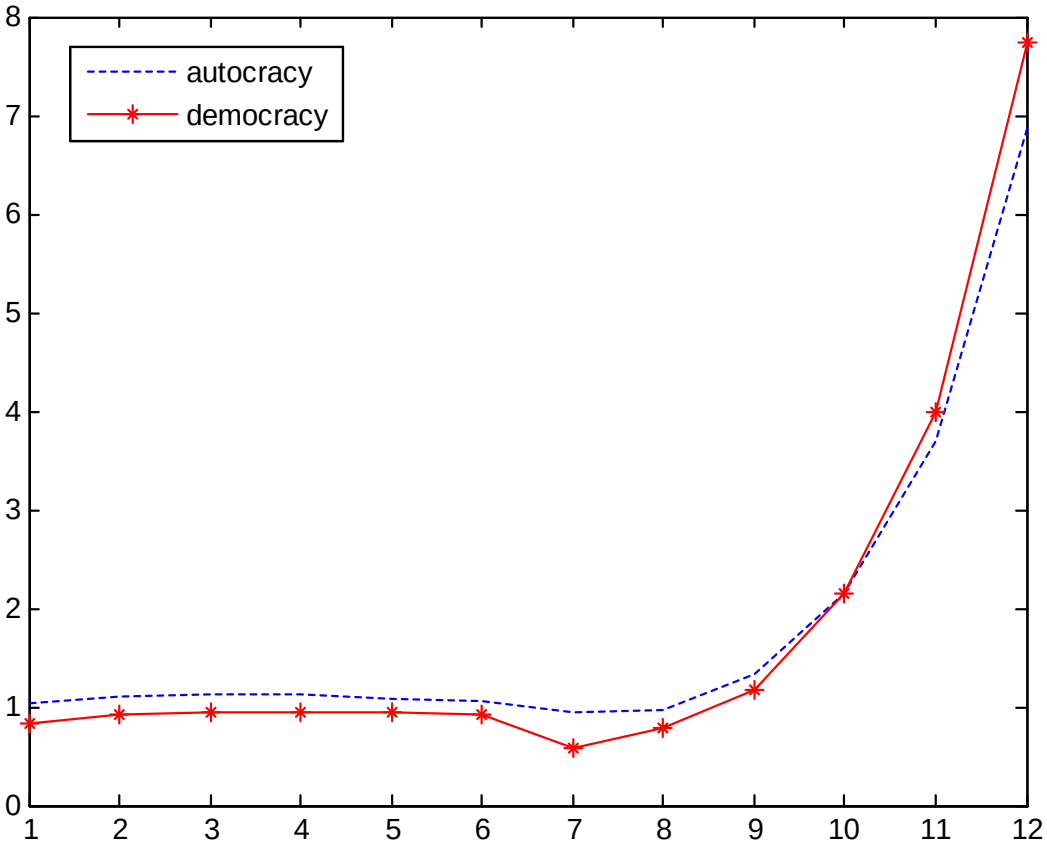

Figure 7c: Expected utility of the Political Elite in autocracy and democracy.
Autocrat draw as in Table 3c.

Tables

Table 1: Optimal tax rates and equilibrium allocations under alternative political regimes.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Good												
τ_L	0	0	0	0	0	0	0	0	0	0	0	0
τ_M	0	0	0	0	.4	0	0	0	0	0	0	0
τ_S	0	0	0	0	0	0	0	0	0	0	0	0
K_M	.100	.193	.308	.444	.018	.027	.008	.002	.001	.000	.000	.000
H_M	.950	1.055	1.226	1.444	.187	.252	.061	.013	.002	.000	.000	.000
r_M	.314	.190	.141	.116	.628	.533	.747	.947	1.123	1.266	1.374	1.451
w_M	.198	.209	.213	.214	.362	.346	.554	.948	1.697	3.141	5.963	11.528
r_L	1.881	2.209	2.612	3.086	.679	.873	.338	.118	.039	.012	.004	.001
Solow	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Elite												
τ_L	0	0	0	0	0	0	0	0	0	0	0	0
τ_M	.7	.7	.7	.7	.7	.6	.4	0	0	0	0	0
τ_S	.7	.7	.7	.7	.7	.7	.7	0	0	0	.7	.7
K_M	.100	.193	.308	.444	.602	.780	.977	.002	.001	.000	.000	.000
H_M	.950	1.055	1.226	1.444	1.706	2.007	2.347	.019	.003	.001	.004	.001
r_M	.314	.190	.141	.116	.100	.091	.084	1.216	1.338	1.426	.446	.459
w_M	.198	.209	.213	.214	.213	.211	.209	.803	1.509	2.901	1.697	3.340
r_L	1.881	2.209	2.612	3.086	3.628	4.236	4.911	.152	.046	.014	.065	.019
Solow	No	No	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes
Bad												
τ_L	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7
τ_M	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7
τ_S	.7	.7	.7	.7	.7	.6	.7	.7	.7	.7	.7	.7
K_M	.100	.252	.379	.484	.570	.641	.632	.609	.607	.637	.704	.813
H_M	.950	1.055	1.179	1.323	1.486	.271	.186	.047	.010	.002	.000	.000
r_M	.314	.292	.276	.264	.254	1.319	1.455	2.094	2.758	3.393	3.939	4.370
w_M	.198	.200	.200	.201	.201	.305	.355	.559	.932	1.628	2.954	5.527
r_L	1.881	2.106	2.364	2.656	2.984	.829	.659	.262	.095	.032	.010	.003
Solow	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Democrat												
τ_L	0	0	0	0	0	0	0	0	0	0	0	0
τ_M	.7	.7	.7	.7	.7	.6	0	0	.2	.2	.2	.2
τ_S	.7	.7	.7	.7	.7	.7	0	0	.7	.7	.7	.7
K_M	.100	.185	.290	.415	.559	.721	.008	.002	.015	.004	.001	.000
H_M	.95	1.055	1.225	1.444	1.704	2.002	.077	.015	.069	.011	.002	.000
r_M	.314	.198	.149	.123	.107	.097	.855	1.058	.457	.505	.538	.560
w_M	.198	.208	.212	.212	.211	.210	.506	.880	.603	1.130	2.172	4.239
r_L	1.881	2.199	2.597	3.065	3.599	4.197	.387	.132	.415	.127	.037	.011
Solow	No	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes

Table 2: Capital, income and output under alternative political regimes.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Good												
k_E	.100	.654	1.157	1.582	1.930	1.875	1.920	1.992	2.164	2.461	2.904	3.519
$k_{\overline{E}}$	.100	.149	.190	.224	.251	.295	.387	.562	.894	1.525	2.742	5.112
K/N	.100	.174	.239	.292	.335	.373	.463	.633	.957	1.572	2.750	5.032
I_E	1.913	2.113	2.189	2.213	1.105	1.398	1.522	1.902	2.432	3.115	3.988	5.106
$I_{\overline{E}}$	.229	.238	.240	.240	.312	.503	.843	1.480	2.700	5.071	9.729	18.945
Y/N	.314	.331	.338	.338	.369	.548	.877	1.501	2.687	4.973	9.442	18.253
Elite												
k_E	.100	.693	1.212	1.642	1.990	2.265	2.481	2.646	3.098	3.725	4.574	6.153
$k_{\overline{E}}$	.100	.147	.188	.221	.248	.269	.286	.299	.589	1.160	2.294	4.532
K/N	.100	.174	.239	.292	.335	.369	.396	.416	.714	1.288	2.408	4.613
I_E	2.044	2.191	2.242	2.253	2.246	2.228	2.206	3.270	4.154	5.313	8.313	15.162
$I_{\overline{E}}$	.223	.234	.237	.238	.236	.235	.233	1.166	2.297	4.555	8.987	17.757
Y/N	.314	.331	.338	.338	.337	.334	.331	1.271	2.390	4.593	8.953	17.628
Bad												
k_E	.100	.252	.379	.484	.570	.641	.632	.609	.607	.637	.704	.813
$k_{\overline{E}}$	.100	.101	.101	.102	.102	.102	.121	.145	.193	.286	.463	.800
K/N	.100	.108	.115	.121	.125	.129	.146	.168	.214	.304	.475	.801
I_E	1.913	1.970	2.009	2.035	2.053	1.052	1.154	1.327	1.683	2.162	2.773	3.552
$I_{\overline{E}}$	.229	.229	.228	.228	.227	.329	.531	.861	1.465	2.599	4.778	9.025
Y/N	.314	.316	.317	.318	.318	.379	.562	.885	1.476	2.577	4.678	8.752
Democrat												
k_E	.100	.543	.937	1.265	1.531	1.740	1.902	1.906	1.989	2.203	2.884	4.456
$k_{\overline{E}}$	.100	.147	.187	.221	.248	.269	.285	.453	.770	1.376	2.540	4.807
K/N	.100	.167	.224	.273	.312	.342	.366	.526	.831	1.417	2.557	4.790
I_E	1.913	2.088	2.153	2.172	.994	1.405	1.783	2.045	2.434	2.968	4.138	6.660
$I_{\overline{E}}$	.229	.238	.240	.239	.309	.485	.750	1.360	2.545	4.866	9.437	18.487
Y/N	.314	.330	.336	.336	.361	.531	.802	1.394	2.539	4.771	9.172	17.896

Table 3a: The decision of the Political Elite. Elite draw.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
τ_L	0	0	0	0	0	0	0	0	0	0	0	0
τ_M	.7	.7	.7	.7	.7	.6	.4	0	0	0	.2	.2
τ_S	.7	.7	.7	.7	.7	.7	.7	0	0	0	.7	.7
I_E	2.044	2.191	2.242	2.253	2.246	2.228	2.206	3.270	4.154	5.313	7.812	14.588
$I_{\overline{E}}$	.223	.234	.237	.238	.236	.235	.233	1.166	2.297	4.555	8.988	17.750
K/N	.100	.174	.239	.292	.335	.369	.396	.416	.714	1.288	2.408	4.605
Y/N	.314	.331	.338	.338	.337	.334	.331	1.271	2.390	4.593	8.954	17.617
Expected utility of the Political Elite												
Autocracy	1.023	1.101	1.129	1.135	1.073	1.082	1.112	1.651	2.097	2.683	4.090	7.201
Democracy	.838	.918	.946	.952	.948	.938	.909	1.504	1.984	2.613	4.241	7.920
Regime	E	E	E	E	E	E	E	E	E	E	D	D
Solow	No	No	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes

Table 3b: The decision of the Political Elite. Bad draw.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
τ_L	0	0	.7	.7	.7	.7	0	0	0	0	0	0
τ_M	.7	.7	.7	.7	.7	.7	.7	0	0	0	.2	.2
τ_S	.7	.7	.7	.7	.7	.7	.7	0	0	0	.7	.7
I_E	2.044	2.191	.659	.829	1.007	1.185	4.060	2.810	3.292	4.109	7.408	14.155
$I_{\overline{E}}$	.223	.234	.072	.090	.109	.127	.480	1.137	2.257	4.503	8.879	17.607
K/N	.100	.174	.239	.221	.215	.218	.229	.381	.671	1.229	2.328	4.504
Y/N	.314	.331	.338	.423	.513	.601	.684	1.246	2.334	4.508	8.830	17.460
Expected utility of the Political Elite												
Autocracy	1.023	1.101	1.129	1.418	1.719	2.017	2.178	1.978	1.914	2.351	3.840	6.937
Democracy	.838	.918	.946	1.257	1.581	1.901	2.204	1.526	1.787	2.231	4.022	7.684
Regime	E	E	B	B	B	B	D	D	D	D	D	D
Solow	No	No	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes

Table 3c: The decision of the Political Elite. Good draw.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
τ_L	0	0	0	0	0	0	0	0	0	0	0	0
τ_M	.7	.7	0	0	.4	0	0	0	0	0	.2	.2
τ_S	.7	.7	0	0	0	0	0	0	0	0	.7	.7
I_E	2.044	2.191	2.197	2.219	1.120	1.417	1.547	1.934	2.475	3.169	7.238	14.257
$I_{\overline{E}}$	.223	.234	.240	.239	.311	.502	.841	1.479	2.698	5.068	9.527	18.425
K/N	.100	.174	.239	.292	.335	.374	.463	.634	.957	1.572	2.750	5.025
Y/N	.314	.331	.338	.338	.369	.548	.877	1.501	2.687	4.973	9.442	18.242
Expected utility of the Political Elite												
Autocracy	1.023	1.101	1.129	1.135	1.072	1.053	.940	.977	1.327	2.151	3.686	6.877
Democracy	.838	.918	.946	.951	.947	.919	.569	.779	1.163	2.137	3.978	7.740
Regime	E	E	G	G	G	G	G	G	G	G	D	D
Solow	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes