Democracy as a Middle Ground: A Unified Theory of Development and Political Regimes[*]

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Abstract

A large literature documents that autocratic regimes have not, on average, outperformed democratic regimes, although they do display greater variance in economic performance. At the same time, no long-lived autocracy currently is rich whereas every long-lived democracy is. This paper puts forth a theory to account for these observations. The theory rests on the idea that autocratic leaders are heterogenous in their preferences and the idea that special interest groups can successfully lobby a democratic regime for policies that delay industrialization. We show that an elite landed class chooses to democratize society only after the economy has accumulated enough wealth.

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1 Introduction

Being of great interest to researchers and policy makers alike, the relationship between political regime and development has been the focus of much recent empirical and theoretical work. The picture that has emerged from this research is by no means a simple one, however. Examining the record over the post World War II period, researchers such as Londregan and Poole (1990), Przeworski and Limongi (1993), Barro (1996), and Rodrik (1999) have shown that although democracies have not outperformed autocracies over the post World War II period, they display less variation in growth experiences. Examining the record over a longer period of time, however, researchers such as Przeworski et al. (2000) and Persson and Tabellini (2009) have shown that every-long lived democracy currently belongs to the set of rich countries. In contrast, no long-lived autocracy belongs to this set.

The objective of this paper is to put forth a theory that can account for these observations. The theory rests on three ideas, each of which have been emphasized separately by others. The first idea, which is prevalent in the work of Sokoloff and Engerman (2000) is that land owners may seek to block industrialization on account that it is accompanied by a decline in land rents. The second idea, which is prevalent in the work of Olson (1982) and Aghion et al. (2007), is that within a democracy special interest groups can easily lobby the government to implement or maintain policy that hurts the rest of society. The final idea, which is prevalent in the work of Reynolds (1982), Delong and Schleifer (1993) and Jones and Olken (2005) is that autocrats are not all alike in their objectives and policies, with some more open to growth than others.

When combined, these elements imply that democracy is a middle ground in terms of economic development, and that a nation will eventually democratize once it has become sufficiently wealthy. As autocrats differ in their preferences, they choose a different mix of policies, thus implying different development paths. A country ruled by a benevolent autocrat will develop fastest as its leader maximizes social welfare, and hence does not want to implement growth inhibiting policy. A country ruled by a member of the landed elite class will develop slower on account that its leader maximizes the welfare of the landed class, and hence erects policies that slow down the economy's industrialization. A country ruled by a selfish autocrat will develop slowest on account that its leader will expropriate as much capital as possible to finance his own consumption. The development policy in a democracy is similar to an elite autocracy as urban workers, who have the greatest influence in a democracy, also gain from slowing down the pace of industrialization.

The similarity in development policies between a democracy and elite autocracy is part of the reason why a landed elite class, who control the nation's polity in our model, eventually

democratize society. This democratization decision only happens after the economy has acquired enough wealth, however. This is because a democratic regime also redistributes land rents to workers. When landed elites have little capital, the tax on land rents represents a significant loss of income, and so democracy is a worse option relative to autocracy, even though there is a chance the autocrat will have preferences that differ from the landed class. Whereas kleptocratic and benevolent autocrats produce bad outcomes for the landed class relative to an elite autocrat, the welfare of a landed household in an expected sense is still greater than his welfare under democracy when the economy has little wealth. With enough accumulation of capital, however, the outcome under democracy does not imply a large welfare loss to the elite as the tax on rental income represents a small fraction of a landed household's total income. At this stage, the landed elite find it in their best interest to democratize society.

We illustrate our theory in a version of the Hansen and Prescott (2002) unified growth model, to which we add the political layer described above. The Hansen and Prescott model gives rise to a Malthusian era with stagnant living standards and rising population, followed by an industrial revolution with slowly rising living standards, followed by a modern growth era with robust and constant increases in living standards. The Malthusian era corresponds to the use of a traditional technology that requires land as well as capital and labor inputs. Industrialization and economic growth begin with the use of the modern technology that requires only capital and labor inputs. The model is well suited for studying the issues at hand because it implies that landowners experience a decline in land rents as the economy industrializes and because it implies that subsequent to industrialization, workers already employed in the modern technology earn higher wages if rural migration is prohibited.

We calibrate our unified model of growth and polity to the economic development path of England and demonstrate that the model matches its political development path reasonably well. In particular, we assign parameter values so the model matches pre-1700 development observations, post-1900 modern growth observations and a starting date of 1750 for the *Industrial Revolution*, and then examine the choice of the landed class to democratize society. We find that the landed class democratize society in 1860, which is roughly the year the right to vote was extended in England to better paid workers. Additionally, as our model predicts that a country's history of autocratic draws matters for the date it democratizes, we use the calibrated model to answer the question how much later would England have democratized if it had been previously ruled by kleptocrats. We find that a history of bad autocratic rulers would have delayed democratization in England by 70 years.

There are vast empirical and theoretical literatures to which this paper relates. Most of

these papers, however, either examine how polity affects development or how development affects polity, but not both.[1] Shen (2007), Acemoglu (2008), Huang (2008), and Paltseva (2008) are four exceptions. The first three of these papers differ importantly from us in that violence or threat of violence is the catalyst of the change in political regimes.[2] Whereas political change is also voluntary in Paltseva (2008), there are important differences between her and our approach. For instance, in Paltseva, all autocrats are essentially kleptocrats, who differ in how much utility they derive from being in power. More importantly, in Paltseva, there effectively is no democratization. In her model, the key decision is whether the autocrat will relinquish some of his power to expropriate resources. While weaker, this autocrat remains in power forever, however.

There clearly are several countries in which democratization was associated with violence, and for which the theories of Shen (2007), Acemoglu (2008), and Huang (2008) are more relevant. However, for many political episodes, there is no evidence that violence was an underlying factor. For these countries, we think our theory is particularly relevant. Spain, perhaps, is the best example of a non-violent transition to democracy. Another case, which is far less known, but perhaps more relevant for our theory is Argentina's flirtation with democracy during the first part of the twentieth century.[3] As documented by Alston and Gallo (2007), Argentina began its transition to democracy in the latter part of the nineteenth century as its per capita income level rose. In 1912, it ended its autocratic tradition with the adoption of free elections with secret ballots. Between 1912 and 1930, democracy evolved and strengthened. This trend was reversed as Argentina felt the effects of the *Great Depression*. In response to this negative shock on Argentina's output, the *Conservatives*, who prior to 1912 controlled the political arena, seized power away from the *Radical Party* by way of fraud. Given that the *Conservatives* retook political control in 1930, the threat of violence could not have been a motivation for their 1912 decision to democratize the country.[4]

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[1] Some of the theoretical papers that examine the causation from political regine to income are Acemoglu and Robinson (2001), Acemoglu et al. (2004), Acemoglu et al. (2005), Acemoglu and Robinson (2007), Acemoglu (2008) and Aghion et al. (2007). Some of the theoretical papers that examine the causation from income to polity are Dahl (1971), Huntington (1991), Rusechemeyer et al. (1992) and Acemoglu and Robinson (2000).

[2] In addition to the political economy literature, there is the unified growth literature to which our paper relates. Some important works in this literature in addition to Hansen and Prescott (2002) include Goodfriend and McDermott (1996), Galor and Weil (2000) and Galor and Moav (2004).

[3] In many ways, the model we develop most closely captures the argument of Sokoloff and Engermann (2000) that landed elites in Latin America stood to lose with industrialization as it implied higher wages to be paid to farm workers.

[4] 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. 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 standards in the postwar period caused the GMD to include more people in the political process

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 whereas section 4 describes its political structure. Section 5 reports the results of a series of numerical experiments based on a calibration of the model to Britain's experience that show that democracy is a middle ground, and that a country with a history of good autocratic draws will democratize first. Finally, Section 6 concludes the paper.

2   Empirical Observations

In this section we present evidence that suggests that democracy is a middle ground in the short run, but not in the long run, thereby motivating our theory. In doing so, we draw on the work of several researchers, particularly Persson and Tabellini (2009), and Rodrik (1999).

We begin with the short run, which has received far greater attention. The majority of this work effectively compares first moments of the distributions of growth rates for democracies and for autocracies, finding no statistical difference. Rodrik (1999), however, provides a more comprehensive picture of the distribution of growth rates by political regimes by examining second moments, finding greater variance of growth rates for autocratic regimes. Thus, both the best and the worst growth performances in this period correspond to autocratic regimes.[5]

Rather than reproduce Rodrik's figures, we plot yearly polity indices for the five fastest growing economies over the 1950-2004 period, which are Singapore, Taiwan, S. Korea, Botswana, and Thailand. These are shown in Figure 1. A country is identified as being democratic if its polity index is between 0 and 10 in the Polity IV data base and autocratic if it is between 0 and negative 10. Only Botswana was democratic at the start of its miracle. Looking more broadly at the fifteen fastest growing economies in this period, we find that two thirds were autocratic when they began their growth miracles. Besides the aforementioned countries, this set includes Cyprus, Japan, Romania, China, Malaysia, Indonesia, Portugal, Mauritius, Republic of Congo, Spain, and Ireland.

[Figure 1 here]

We next turn to the long-run, which focusses on the relation between income levels and polity rather than growth rates. The relevant data are summarized in Figures 2 and 3. Figure 2 pertains to those countries that were listed as being democratic in 2000 according to the Polity IV Project and is a reproduction of Persson and Tabellini (2009, Figure 2) whereas Figure 3 pertains to those countries that were listed as being autocratic. Both figures plot each country's

(Mau-Kei 2004).

[5] Similar findings are reported in Cuberes and Jerzmanowki (2008).

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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.

Figure 2 shows that every country with a long history of democratic rule, (i.e., 100 years or more), is rich, (i.e. displays per capita GDP greater or equal to 40 percent of the US level). In contrast, Figure 3 shows that only one country with a history of 100 years or more of autocratic rule is rich. This country is Qatar, whose main source of income is, of course, oil. While perhaps not as dramatic, the pattern holds for shorter durations as well. For example, almost every country with a history of 50 or more years of democracy is rich whereas no non-oil autocracy is. A simple linear regression of duration of regime on income shows that length of duration of democracy is positively correlated with income with a slope of .005. For autocracies, the slope of the regression line is not statistically different from zero.

[Figures 2 and 3 here]

Whereas one might be tempted to conclude from Figures 2 and 3 that democracy causes income, the short run findings do not support this direction of causation. Figure 1 lends further support for this direction of causation, as it shows that, with the exception of Singapore, countries that experienced a growth miracle became more democratic as incomes rose. For these reasons, we make the causation from income to democracy a key feature of our theory.[6]

3   The Model - Economic Structure

We start by describing the economic structure of the model and relevant maximization problems of its private agents, postponing for now the description of its political structure. In doing so, this section treats policy parametrically and examines the choices of private agents given that a certain policy is in place.

The economic side of the model is a version of the Hansen and Prescott (2002) development and growth model modified to allow for one-period lived heterogeneous households and spatial elements. In particular, whereas all households are endowed with capital, only some are endowed with time and only some are endowed with land. Moreover, whereas there are still two technologies to produce the economy's single final good, we assume that the Malthusian (traditional) technology is operated in the countryside whereas the Solow (modern) technology is operated in the city side. This implies that a worker household (i.e., one who is endowed with time) begins his life living in either the rural area or urban area, depending on whether

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[6] Acemoglu et al. (2007) argue this causation is not robust using a fixed effect model in a regression of income on democracy. Their finding has been criticized on econometric grounds by Gundlach and Paldam (2008).

his parents were employed by a Malthusian firm or a Solow firm. Whether he ends his life in his area of birth depends on his decision whether to migrate.[7]

We now describe in detail the economic structure of the model.

3.1 Business Sector

The business sector is perfectly competitive, and produces a single composite commodity by one of two Cobb-Douglas technologies that differ in their mix of inputs and rates of technological change. In addition, the two technologies differ in their locations. In particular, the traditional or Malthusian technology can only be operated in the rural region whereas the modern or Solow technology can only be operated in the urban region.

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

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

In Equation (1), A_{mt} is total factor productivity, which 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

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

Total factor productivity in the modern technology, A_{st}, also grows at an exogenous at rate denoted by $\gamma_s \geq 0$. In contrast to the traditional technology, TFP in the modern technology is affected by policy. Let $0 \leq \pi_{st} < 1$ denote this policy barrier in period t. Then, $A_{st} = (1 + \gamma_s)(1 - \pi_{st})A_{st-1}$. [8]

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[7] 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.

[8] In specifying this law of motion for Solow TFP, it follows that a barrier implemented in period t has a permanent effect on Solow TFP. In Section 6.4, Sensitivity of Results, we consider the alternative assumption where the TFP barrier is temporary.

3.2   Household Sector

Households in the model live for a single period and belong to one of three groups. The first group consists of the economy's elites, who own its stock of land. The next two groups consist of worker households, and are endowed with one unit of time. These groups are distinguished by region of birth, either rural or urban. We use the letter $j = \{e, r, u\}$ to denote a household's type and N_{jt} to denote its measure. The total population at time t is denoted $N_t = N_{et} + N_{rt} + N_{ut}$. For future reference, let p denote the working class and N_{pt} denote the measure of such agents, i.e. $N_{pt} = N_{rt} + N_{ut}$.

3.2.1   Preferences

Preferences are the same across household types. Each household derives utility from its own consumption as well as the total bequests it leaves to its children. Bequests are in the form of today's final good, and hence do not include land holdings in the case of elite households. In particular, the utility of a household of type j is given by

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

where c_{jt} is household consumption, and B_{jt} are total family bequests.

3.2.2   Demographics

Demographics are affected by worker migration as well as population growth.

Migration   We assume only rural households can migrate, hence, ruling out the possibility of reverse industrialization.[9] There is a time cost associated with migrating to the city, denoted by π_{ut}. Thus, a rural household who migrates can only supply $1 - \pi_{ut}$ units of labor to Solow firms. This time cost is the result of policy, and not a feature of technology. On account of migration, the measure of households employed in the modern sector, N_{st}, will not necessarily equal the measure of households that begin in the urban sector, N_{ut}. Similarly, the measure of households employed in the traditional sector, N_{mt} will not necessarily equal the measure of households who start in the rural sector, N_{rt}.

Population Growth   Following Hansen and Prescott (2002), children are exogenous from the standpoint of the parent. For elite households, we assume zero population growth, namely,

$$N_{et+1} = N_{et}$$

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[9] We never found in any experiment that urban workers would have wanted to return to the countryside.

This assumption is meant to reflect the prevalence of the primogeniture system prior to the 18th century, where all land was passed down to the oldest child. For worker households, we assume that in period t their measure grows at rate g_t. Rural and urban households, therefore, have the same growth rate in each period. This assumption is made for analytical and notational convenience, rather than for historical accuracy. In particular, by assuming the same population growth rate for all households, one does not need to divide city workers into migrants and non-migrants for the purpose of determining population dynamics.

Dynamics   Let σ_t denote the fraction of rural households that do not migrate in period t. Given that N_{rt} households begin the period in the rural sector, N_{ut} households begin the period in the urban sector, the measure of households in the next period that starts out in the rural sector is

$$N_{rt+1} = g_t \sigma_t N_{rt} \tag{3}$$

and the measure of households in the next period that starts in the urban sector is

$$N_{ut+1} = g_t(1 - \sigma_t)N_{rt} + g_t N_{ut}$$

Next period's population is thus,

$$N_{t+1} = N_{rt+1} + N_{ut+1} + N_{et+1}$$

3.2.3   Endowments

A worker household is endowed with one unit of time whereas an elite household is endowed with l_{et} units of land.   The endowment of an elite corresponds to the land he inherits from his parents. As the measure of elite households is constant over time, land endowments are constant. Denoting the economy's stock of land by L, an elite household's land endowment in any period is $l_e = L/N_e$.

All households receive bequests from their parents, which can be converted into physical capital. Let k_{jt} denote the capital of a household of type $j \in \{e, r, u\}$ alive in period t. The amount of capital a household is endowed with also depends on the fraction of bequests expropriated by the government, denoted by $0 \leq \pi_{bt} < 1$. For an elite household born in period t,

$$k_{et} = (1 - \pi_{bt})B_{et-1}$$

Similarly, for a rural household born in period t

$$k_{rt} = (1 - \pi_{bt})B_{rt-1}/g_{t-1}$$

For an urban household born in period t, we assume an implicit tax and transfer system ensuring that all such households have identical bequests. Thus,

$$k_{ut} = (1 - \pi_{bt})[B_{ut-1}N_{ut-1} + (1 - \sigma_{t-1})B_{rt-1}N_{rt-1}]/N_{ut}$$

Absent this assumption, bequests received by urban households would possibly differ on account that migrant urban parents would typically have lower earnings than non-migrant urban parents.

3.3 Utility Maximization

With Cobb-Douglas preferences, each household, regardless of its type, spends fraction, μ, of its income on the consumption good, and fraction, $1 - \mu$, on bequests, where μ is the consumption share parameter in the household utility function. Thus, the optimal consumption and bequests are

$$c_{jt} = \mu I_{jt} \tag{4}$$

$$B_{jt} = (1 - \mu) I_{jt} \tag{5}$$

where I_{jt} denotes the income of a household of type $j \in \{u, r, e\}$ in period t. Substituting (4) and (5) into the utility function, one obtains the indirect utility of the type j household:

$$W_{jt} = \mu^{\mu} (1 - \mu)^{1-\mu} I_{jt} \tag{6}$$

Income differences between rural, urban and elite households are the result of differences in endowments and policies that target specific household groups. For the landed elite, income is generated by renting capital and land. Capital is not technology specific, and so can be rented to either Solow or Malthus firms at the same rental price. A tax on land rents is the lone government policy that affects landowner's income. Specifically, landed elite income is

$$I_{et} = (1 - \pi_{lt})r_{lt}l_e + r_{kt}k_{et} \tag{7}$$

where r_{lt} denotes the rental price of land, r_{kt} denotes the rental price of capital, and π_{lt} denotes the tax rate on land rental income.

Worker households in contrast earn income by renting capital and supplying labor. The main policies that affect their income are a transfer payment, T_{lt}, financed out of of land rent taxes, and a migration barrier, $0 \leq \pi_{ut} < 1$. The migration barrier reduces the amount of time that a migrant worker can supply to Solow firms. Its existence implies that the wage rate paid by Solow firms, w_{st}, will not equal the wage rate paid by Malthus firms, w_{mt} in equilibrium. In addition to these two policies, we assume that worker households are subject to a fixed time cost

associated with lobbying that depends on the political regime in place as well as the household's region of birth. We postpone the description of these fixed costs until next section. For the purpose at hand, we simply denote these fixed time costs by f_{jt}, $j \in \{r, u\}$.

In light of the above discussion, the income of a household born in the city is just

$$I_{ut} = w_{st}(1 - f_{ut}) + r_{kt}k_{ut} + T_{lt}$$

and the income of a household born in the countryside is

$$I_{rt} = w_{mt}(1 - f_{rt}) + r_{kt}k_{rut} + T_{lt}.$$

Whereas a rural household can migrate and earn the Solow wage rate, migrants must earn the same wage income as stayers in equilibrium. For this reason, every household born in the rural region earns the same income regardless of whether it migrates or not.[10]

3.4 Profit Maximization

As land is only used in the traditional sector, the Malthusian technology will be used in every period. The profit maximizing conditions of Malthusian firms are

$$r_{kt} = \psi A_{mt} K_{mt}^{\psi-1} H_{mt}^{\phi} L_{mt}^{1-\psi-\phi} \tag{8}$$

$$w_{mt} = \phi A_{mt} K_{mt}^{\psi} H_{mt}^{\phi-1} L_{mt}^{1-\psi-\phi} \tag{9}$$

and

$$r_{lt} = (1 - \phi - \psi) A_{mt} K_{mt}^{\psi} H_{mt}^{\phi} L_{mt}^{-\psi-\phi} \tag{10}$$

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

$$A_{st} K_{st}^{\theta} H_{st}^{1-\theta} - w_{st} H_{st} - r_{kt} K_{st} \tag{11}$$

and the profit maximizing conditions are

$$r_{kt} \geq \theta A_{st} K_{st}^{\theta-1} H_{st}^{1-\theta} \tag{12}$$

$$w_{st} \geq (1 - \theta) A_{st} K_{st}^{\theta} H_{st}^{-\theta} \tag{13}$$

As in Hansen and Prescott (2002), the Solow technology is not profitable to operate as long as the minimum cost of producing one unit of output with the Solow technology exceeds one. This is

$$A_{st} \leq \left[\frac{w_{st}}{1-\theta}\right]^{(1-\theta)} \left[\frac{r_{kt}}{\theta}\right]^{\theta} \tag{14}$$

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[10] For this reason, it is unnecessary to distinguish the optimal consumption and bequest choices of migrant rural households from non-migrant rural households.

The lone difference between this expression and the one derived in Hansen and Prescott (2002) is the appearance of the Solow wage rate in the unit cost term. In Hansen and Prescott (2002) the wage rates in the two sectors are identical, but here they need not be on account of the migration barriers. To express this condition in terms of the wage rate paid by Malthusian firms, we use the result that there must be migration in the first period the Solow technology is used, and the result that a rural household must earn the same wages if he stayed or migrated, namely,

$$w_{mt}(1 - f_{rt}) = (1 - \pi_{ut} - f_{rt})w_{st}$$

Inserting this expression for w_{mt} into the negative profit condition implies:

$$A_{st} \leq \left[\frac{1 - f_{rt}}{1 - f_{rt} - \pi_{ut}}\right]^{1-\theta} \left[\frac{w_{mt}}{1-\theta}\right]^{(1-\theta)} \left[\frac{r_{kt}}{\theta}\right]^{\theta}$$

To understand how policy affects the date an economy begins to industrialize, we insert the law of motion for Solow TFP in period t, $A_{st} = (1 - \pi_{st})(1 + \gamma_s)A_{st-1}$ into the left hand side of the above expression. We next use the result that if Solow is not profitable, then all the economy's capital and labor are employed in Malthus and so the Malthusian wage rate and the rental price of capital equal their marginal products when all of the economy's resources are employed in that sector. Equation (14) can thus be rewritten as:

$$(1 - \pi_{st})(1 + \gamma_s)A_{st-1} \leq A_{mt} \left[\frac{1 - f_{rt}}{1 - \pi_{ut} - f_{rt}}\right]^{1-\theta} \left[\frac{\phi}{1-\theta}\right]^{(1-\theta)} \left[\frac{\psi}{\theta}\right]^{\theta} K_t^{\psi-\theta} N_{pt}^{\phi-(1-\theta)} L_t^{1-\psi-\phi} \tag{15}$$

As (15) shows, the Solow TFP barrier and the migration barrier directly delay the date at which the economy first begins to use the Solow technology. The expropriation barrier does not appear in the above expression, but it is easy to verify that it will affect the right hand side of the equation by lowering the economy's capital stock.[11]

3.5 Equilibrium Prices and Quantities

As the first period in our model is indexed by $t = 1$, the relevant initial conditions for the economy are the bequests B_{e0}, B_{r0} and B_{u0} and the measure of each household type, N_{e1}, N_{r1} and N_{u1}. The policy, which at this stage is treated parametrically, consists of $(\pi_{ut}, \pi_{bt}, \pi_{lt}, \pi_{st}, T_{lt})$ and lobbying costs, f_{rt} and f_{ut}. In addition, policy includes government consumption, c_{gt}. Policy, albeit exogenously given for now, must be feasible. A policy is feasible if the sum of land rent transfers to worker households equals land taxes collected from landed households and if the sum of government consumption equals expropriated bequests.

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[11] 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. The policy maker can delay the switch to Solow by increasing π_{ut}, the cost of commuting to the urban area.

In terms of prices and allocations, the equilibrium path for the economy constitutes a sequence of household variables $\{W_{et}, W_{rt}, W_{ut}, k_{et}, k_{rt}, k_{ut}, B_{et}, B_{rt}, B_{ut}, c_{et}, c_{rt}, c_{ut}, \sigma_t\}$, a sequence of firm allocations, $\{Y_{mt}, K_{mt}, H_{mt}, Y_{st}, K_{st}, H_{st}\}$, a sequence of prices $\{w_{mt}, w_{st}, r_{kt}, r_{lt}\}$ and a sequence of laws of motions for $\{N_{et+1}, N_{rt+1}, N_{ut+1}, l_{et+1}\}$, which satisfy

1. Utility maximization of the households. Given the policy, prices and endowments, (c_{jt}, B_{jt}) maximizes the utility of the household $j = e, r, u$ subject to its budget constraint, and W_{jt} equals the household's indirect utility.

2. Migration decision: Rural households stay put if $w_{mt}(1 - f_{rt}) > (1 - \pi_{ut} - f_{rt})w_{st}$, and are indifferent if $w_{mt}(1 - f_{rt}) = (1 - \pi_{ut} - f_{rt})w_{st}$

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

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

5. Market clearing

    a. Goods market: $N_{et}(c_{et} + B_{et}) + N_{rt}(c_{rt} + B_{rt}) + N_{ut}(c_{ut} + B_{ut}) + c_{gt} = Y_{st} + Y_{mt}$
    b. Land rental market: $L_t = N_{et}l_e$
    c. Capital rental market: $K_{mt} + K_{st} = N_{et}k_{et} + N_{rt}k_{rt} + N_{ut}k_{ut}$
    d. Labor markets: $\sigma_t N_{rt}(1 - f_{rt}) = H_{mt}$ and $(1 - \sigma_t)N_{rt}(1 - \pi_{ut} - f_{rt}) + N_{ut}(1 - f_{ut}) = H_{st}$

6. Laws of Motion

    a. $N_{rt+1} = g_t \sigma_t N_{rt}$
    b. $N_{ut+1} = g_t[(1 - \sigma_t)N_{rt} + N_{ut}]$
    c. $N_{et+1} = N_{et}$
    d. $k_{et} = (1 - \pi_{bt})B_{et-1}$
    e. $k_{ut} = (1 - \pi_{bt})[B_{ut-1}N_{ut-1} + (1 - \sigma_t)B_{rt-1}N_{rt-1}]/N_{ut}$
    f. $k_{rt} = (1 - \pi_{bt})B_{rt-1}/g_{t-1}$

7. Policy Feasibility

    a. Land Tax system: $\pi_{lt}r_{lt}L = (N_{rt} + N_{ut})T_{lt}$
    b. Expropriations: $c_{gt} = \pi_{bt}(B_{et-1}N_{et-1} + B_{rt-1}N_{rt-1} + B_{ut-1}N_{ut-1})$

4 The Model - Political Structure

Having described the economic side of the model, we next turn to its political side, of which there are two layers. 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 policy.

By choosing autocracy, the political elite subject the economy to uncertainty over the preferences of the ruler. There are three types of autocratic rulers: 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. By choosing democracy, the political elite do not subject the economy to this type of uncertainty. However, in democratizing society they empower labor so that workers can lobby democratic leaders to choose policies that favor them. Prior to industrialization, the labor lobby consists of all worker households, but subsequent to industrialization, the labor lobby consists only of urban households.

We now describe this political structure in detail, starting with the bottom layer.

4.1 Policy Determination

We denote the political regime in period t by the letter R_t, where R_t can either be A for autocracy or D for democracy. Regardless of regime, the policy maker chooses a six-element vector of instruments, $(c_{gt}, \pi_{ut}, \pi_{bt}, \pi_{lt}, \pi_{st}, T_{lt})$. As discussed in the previous section, land tax revenues are redistributed to worker households in the form of a lump-sum transfer, and the leader's private consumption are financed out of expropriated bequests.[12] On account of these assumptions, the leader's choices effectively reduces to four-instruments, $\pi_{ut}, \pi_{bt}, \pi_{lt}$ and π_{st}.

There are clearly other policy instruments we could have modeled. For instance, we could have added an investment barrier that was technology specific, such that one unit of output invested in the modern technology resulted in less than one unit of Solow capital. The policy measures we model represent the smallest set that generates different policy choices and hence development paths under the different regimes and different autocrats. The omission of other policy instruments such as the technology-specific investment barrier is based on findings that their inclusion did not alter the results.

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[12] Whereas the policy component, π_{lt}, constitutes a tax on land rental income in the model, we think of it more in the nature of land reform. This is the implicit reason why we assume that all land rental taxes are transferred to worker households and are not used by the leader for his own consumption.

4.1.1 Autocracy

We begin with the policy choices when an autocratic regime is in place. There are three autocrat types, which we refer to as *Good*, *Elite*, and *Bad*, denoted by the letter $a \in \{G, E, B\}$. Each autocrat choose the vector $\Omega^a = (c_{gt}^a, \pi_{ut}^a, \pi_{bt}^a, \pi_{lt}^a, \pi_{st}^a, T_{lt}^a)$ subject to $N_{et}\tau_{lt}r_{lt}l = (N_{rt} + N_{ut})T_{lt}$ and $c_{gt} = \pi_{bt}(B_{et-1}N_{et-1} + B_{rt-1}N_{rt-1} + B_{ut-1}N_{ut-1})$ to maximize his utility. Utility is a function of the autocrat's own consumption, the indirect utility of elite households, the indirect utility of rural households, and the indirect utility of urban households. Let V^a denote the welfare of autocrat a. The welfare of a type a autocrat is:

$$V^a = \rho^a c_{gt}^a + (1 - \rho^a)[\lambda_t^a W_{et} + (1 - \lambda_t^a)[\frac{N_{rt}}{N_{pt}}W_{rt} + \frac{N_{ut}}{N_{pt}}W_{ut}] \tag{16}$$

where ρ^a is the weight a type a autocrat places on his consumption, and λ_t^a is the weight he places on the welfare of the elite class versus the working class. The weight he places on the welfare of the elite class versus the working class is time dependent to allow for changes in the demographic structure among workers and elites over the development process.[13]

Autocratic heterogeneity is captured via different weights in (16). For the good autocrat, i.e., $a = G$, $\rho^G = 0$ and $\lambda_t^G = N_{et}/N_t$. Thus, autocrat G is essentially a social planner who maximizes a weighted average of household welfare with weights that are equal to the share of each household type in the population. Given the deadweight losses with imposing barriers, a good autocrat will be inclined to erect zero barriers. For the elite autocrat, i.e., $a = E$, $\rho^E = 0$ and $\lambda_t^E = 1$, and so $V^E = W_{et}$. Thus, as the elite autocrat maximizes the indirect utility of a member of the elite class, he may want to impose barriers that delay the industrialization process. For the bad autocrat, i.e., $a = B$, $\rho^B = 1$, so that he maximizes his own consumption. Thus, the bad autocrat will want to expropriate bequests at the highest rate possible.

4.1.2 Democracy

Whereas the policy instruments available in a democracy are the same as in an autocracy, namely, $\Omega^d = (c_{gt}^d, \pi_{ut}^d, \pi_{bt}^d, \pi_{lt}^d, \pi_{st}^d, T_{lt}^d)$, the objective function is different. By assumption, the democratic ruler cares only about the welfare of workers, or certain subclasses of workers. In particular, the welfare of a democratic ruler, V^D, is

$$V^D = \begin{cases} W_{rt} \; if \; t \leq t^* \\ W_{ut} \; if \; t > t^* \end{cases} \tag{17}$$

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[13] By assumption, an autocrat's reign is only a single period so he chooses policy 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 policy that harms landowners. This happens if the autocrat turns out to be a kleptocrat, in which case capital is expropriated. In contrast, when the autocrat belongs to the class of landowners, he will block the new technology and delay industrialization.

In (17), t^* denotes the first period in which the Solow technology is used. Accordingly, prior to industrialization, the democrat maximizes the utility of the representative worker, but thereafter, the democrat maximizes the welfare of workers born in the city.

Microfoundations for (17) are based on the lobbying model of Persson and Tabellini (2000), and presented in the Appendix. By assumption, workers are more politically powerful in a democracy and thus able to affect the policy platforms of democratic candidates through lobbying efforts. When the worker class represents a majority of the population, this assumption is in line with the median voter model.[14]

We assume that the lobbying group incurs a fixed cost per member denoted by f_d, measured in units of time. By assumption, no worker can free ride and avoid this cost. Prior to the existence of an indigenous urban population, (i.e., $t \leq t^*$), the lobbying group is the population of worker households, all of whom start the period in the rural sector. For this reason, $f_{rt} = f_d > 0$ for $t \leq t^*$. Once an indigenous urban population is in place (i.e., $t > t^*$), $f_{rt} = 0$ and $f_{ut} = f_d > 0$. Urban immigrant workers, therefore, do not incur any fixed cost.

The assumption that the democratic ruler seeks to maximize the welfare of the average industrialized worker once an indigenous urban population exists is important to the results, specifically, that democracy gives rise to some development inhibiting policy. In particular, in maximizing the welfare of urban workers, a democratic leader will impose migration barriers in order to prevent a decline in the wage rate paid by Solow firms. This assumption has a real world basis, as well: in Latin America, many populist policies favored urban residents at the expense of rural households.

4.2 The Decision of the Elite

Having described the objectives of autocratic and democratic rulers, we next turn to the decision of the elites over the nation's political regime. This decision, which is made at the start of each period, is reversible. Thus, the landed elite at the start of each period decide whether the economy should be autocratic or democratic.

The decision of the elite over polity is a simple comparison of expected utility under the two regimes. In particular, the elites choose democracy if the utility of its representative member under democracy exceeds the expected utility under autocracy. Namely

$$W_{et}\left(\Omega_t^d\right) > \sum_a Pr^a(B_{t-1})W_{et}\left(\Omega_t^a\right) \tag{18}$$

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[14] Another motivation for this utility function is that it makes the choice of the landed elite to democratize society interesting. If the elite utility entered the democratic leader's objective, then the elite would choose to democratize starting in the first period.

where W_{et} is determined by (6).

In (18), Pr^a denotes the probability of drawing an autocrat of type a, which is a function of the total bequests from the previous period. In what follows, we assume the probability of drawing a good autocrat is independent of parental bequests so that $Pr^a(B_{t-1}) = Pr^a$; we assume the probability of drawing a bad autocrat is a non-decreasing function of bequests, and the probability of drawing an elite is a non-increasing function of bequests that satisfies $Pr^e(B_{t-1}) = 1 - \Pr^a - Pr^b(B_{t-1})$.

The assumption that the probability of drawing a bad autocrat is a non-decreasing function of parental bequests turns out to be important for some of the model's results, namely, that countries with a history of bad draws democratize later. There is an empirical and theoretical basis for this assumption as well. Empirically, countries with greater natural wealth have often been ruled by kleptocrats. A number of authors such as Sala-i-Martin and Subramanian (2003) have linked oil reserves with kleptocratic regimes in the postwar period, and Drelichman and Voth (2003) have linked inflows of silver reserves from Peru to a deterioration in good governance by the Spanish crown at the turn of the 17th century.

Theoretically, the assumption is consistent with the choice of an autocrat whether to be a kleptocrat. Suppose for instance that an elite's utility depends on his own personal consumption and inclusion into elite society. Suppose further that if an individual expropriates bequests he will be ostracized from elite society. Then, he will be more likely to choose to be kleptocratic if bequests are larger. In the appendix, we demonstrate how this implies a probability function that is increasing in the amount of total bequests.[15]

4.3 Political Equilibrium

With this extra layer, we must add the following elements to the definition of an equilibrium polity type and lobbying costs $\{R_t, f_{ut}, f_{rt}\}$, probability of realizing a particular autocratic type, $\{Pr^a(B_{t-1})\}$, autocrat type a_t in the case when $R_t = A_t$ and policies $\{(c_{gt}^z, \pi_{ut}^z, \pi_{bt}^z, \pi_{lt}^z, \pi_{st}^z, T_{lt}^z)_{z \in Z}\}$. Here we use Z to denote the set of all possible rulers, namely, a good, elite, and bad autocrat, and a 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 (18).

2. The policy $(c_{gt}^z, \pi_{ut}^z, \pi_{bt}^z, \pi_{lt}^z, \pi_{st}^z, T_{lt}^z)$ maximizes the objective of each potential leader.

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[15] The assumption that the probability of drawing a good autocrat is independent of bequests corresponds to a society where some potential leaders are truly benevolent in their philosophy, and cannot be tempted by factors that affect their personal gain.

5 Numerical Experiments

We next explore 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 with the dynamic elements being the measure of working households, bequests, and TFP. Despite the static nature of the optimization problems, closed form solutions are not forthcoming. For this reason, we parameterize the model and solve for its equilibrium numerically. The basic strategy for assigning parameter values is to match certain features of England's development path over the 1650 to 2000 period, most notably, an industrialization date around 1750.

We use the calibrated structure to examine three questions. First, what is the model's predictions for the date England should have democratized? Empirically, we identify 1867, the year that the right to vote was extended to better paid workers, as the date of democratization in England. Second, does the model predict that democracy is a middle ground development path? Recall, that in the postwar period autocracies have not on average performed differently than democracies, although they display greater variance in performances. Lastly, does the model predict that higher incomes causes democratization? Here, we are interested in seeing whether the model is consistent with the observation that every long-lived democracy has a high living standard whereas no long-lived autocracy is.

To answer these questions, we proceed in two steps. In the first, we shut down two elements of the model economy. Namely, we remove uncertainty over autocratic type and the landed elite's decision to democratize society. Whereas policy is endogenous, an economy's leader is taken as given and constant over time. 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.

5.1 Parameters

Before assigning parameters it is necessary to identify the empirical counterparts of a period as well as the first model period. Given that each generation lives for a single period, the empirical counterpart of a model period is identified as 35 years. For the starting date, i.e., $t = 1$, we associate it with the year 1650. Whereas the choice of starting date is unimportant to the results, we associate $t = 1$ with 1650 because England's *Glorious Revolution* occurs in 1688.

Table 1 reports the values of the model parameters, and provides a brief comment on how each value is assigned. An additional comment is warranted in the case of the initial value for

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the Solow TFP parameter. As reported, its value is assigned so that industrialization starts in 1750 ($t = 4$) for an economy governed by good autocrats. The reason we assume the economy is governed by good autocrats is twofold. First, the date at which an economy industrializes depends on its history of rulers, and second, our interpretation of England's history is that it was ruled by good autocrats following the *Glorious Revolution.*

[Table 1 here]

In addition to the parameters listed in the table, it is necessary to specify and parameterize the population growth rates of workers and the functions governing the probability of drawing each particular type of autocrat. For the population growth rates, we simply assign the rates for each associated period as estimated by Maddison (2001). For the probability of drawing each autocratic type, we assume the following parameterized functions:

$$Pr^G = .10 \tag{19}$$

$$Pr^B(B_{t-1}) = \min\{.85, 0.10 + 0.5B_{t-1} + .8B_{t-1}^2\} \tag{20}$$

and

$$Pr^E(B_{t-1}) = 1 - Pr^G(B_{t-1}) - Pr^B(B_{t-1}) \tag{21}$$

By assumption then, the probability of drawing a bad autocrat increases at an increasing rate and the probability of drawing a elite autocrat decreases at an increasing rate. As there is no independent evidence that suggests a positive second derivative for $Pr^B(B_{t-1})$, we will investigate the relevance of this assumption in the sensitivity analysis conducted at the end of this section.

Finally, in light of the objectives of policy makers, it is necessary to place upper bounds on the policy choices. For this, we set an upper bound on the choice of land rent taxes to .9; an upper bound for the bequest expropriation rate at .9; an upper bound on migration barriers to .8; and an upper bound on Solow TFP barriers to .3. This completes the calibration procedure.

5.2 The Effect of Polity on Performance

We begin by removing the randomness over autocrat types and the choice of political regime by the landed elite, and solve the equilibrium paths for four economies, each with a different ruler type that does not change over time. The four economies correspond to a good autocracy, elite autocracy, bad autocracy, and democracy. Each economy starts out with the same amount of bequests for elite households and worker households and the same size population. By the

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parameterization, only the Malthusian technology is used in the first period, so that every worker resides in the rural area in each economy.

Figures 4 and 5 document the paths of per capita capital and GDP, respectively, for each of the four economies over the first 20 periods.

[Figures 4 and 5 here]

For both measures, the ranking of performances is: good autocracy, democracy, elite autocracy, and then bad autocracy. The differences between regimes is more pronounced for the capital stock measures. This is understandable in light of the importance, or lack thereof, of capital in the production functions. Democracy is a middle ground and autocratic regimes display greater variation in their development paths.

Table 2 reports the optimal policies in each period and the profitability of the Solow technology for each regime. Democracy and good autocracy are both first to industrialize in period 4. The bad autocracy is next industrializing in period 5, followed by the elite autocracy in period 7. The good autocrat does not erect any barriers whereas the bad autocrat only expropriates bequest. The elite autocrat initially does not put up any barriers, but then eventually retards development by implementing both migration and Solow TFP barriers. In the democracy, land rents are initially redistributed and post industrialization, barriers to migration are erected.

[Table 2 here]

The policy choices for each economy are easy to understand in light of its leader's preferences, and industrialization dates are easy to understand in light of the policy choices. The good autocrat never erects any barriers since he effectively maximizes aggregate welfare in the economy. Without any distortions in place, the economy industrializes early. The bad autocrat only expropriates capital because this is the only way to finance his personal consumption. With no barriers to either migration or Solow TFP, a bad autocrat has an indirect and modest effect on the condition for which Solow is profitable, namely by lowering the aggregate capital stock. Thus, industrialization is delayed only one period compared to the good autocracy. In a democracy, the leader redistributes land (rents) at the upper bound in every period as he cares only about the welfare of workers. This policy choice has no effect on the Solow profitability condition, however, because land has no use in the economy other than the traditional and because preferences are homothetic. It is only after the economy industrializes, so that the leader wishes to maximize the welfare of the indigenous urban working class, that a distortionary, growth inhibiting policy is implemented. Thus, the democracy industrializes in the same period as a good autocracy. In contrast, the elite autocrat implements distortionary policy both in the form of a

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migration barrier and TFP barrier prior to industrialization because he seeks to maximize the welfare of the landed elite, who experiences a decline in land rents when resources move into the modern sector. The Solow TFP barrier has a direct effect on the Solow profitability condition, which contributes importantly to the three period delay in the economy's industrialization.[16]

[Figures 6-8 here]

Figures 6-8 highlight other differences between the four economies. Figure 6 compares the speed of the structural transformation between economies by plotting the N_{ut}/N_{pt} in each period. Not surprisingly, the structural transformation occurs fastest in a good autocracy. The pattern is very similar for all autocratic regimes, but different for the democracy. Whereas the democracy's structural transformation starts before the bad and elite autocracies', it proceeds at a slower rate. This corresponds to the erection of the migration barrier that follows the establishment of an urban working class.

Figure 7 displays the evolution of elite income under the four economies whereas Figure 8 plots Gini coefficients for the four economies. Not surprisingly elite income is greatest in the elite autocracy, followed by democracy, good autocracy, and lastly by bad autocracy. These rankings are relevant for understanding the results of the next subsection. In terms of the distribution of income, the Gini coefficients shown in Figure 8 reveal that inequality increases initially under each autocratic ruler over the pre-industrialization period, but subsequently declines, approaching zero in the limit. Not surprisingly, the decline is fastest in the good autocracy on account of it being first to industrialize. The evolution of inequality under democracy is very different, and displays an inverted u-shape pattern. Initially, inequality is low on account of the land redistribution tax. However, with industrialization and the erection of migration barriers by urban workers, wage differences between urban and rural workers rise, leading to a rise in inequality. Eventually, enough of the population has migrated, and with the assumption that guarantees that individuals born in the urban area start with the same bequests, incomes become more equal.[17]

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[16] Interestingly, whereas the elite autocrat could continue to add new barriers to Solow TFP and prevent industrialization for additional periods, he chooses not to do so. The reason for this is that as income and wealth increase, the capital component of the elite's income comes to represent a greater fraction of total income. At this stage, the elites benefit from industrialization, as industrialization leads to a higher rental price of capital. This explains why Solow TFP barriers are never erected post industrialization and why migration barriers are lessened.

[17] Over time, the Gini coefficients in all four economies approach 0. The reason the economies become more equitable over time is that the population shares of the landed elite and the rural workers eventually become negligible. Towards the end of the modern era, there is effectively only one group holding all the wealth in the economy, namely the urban workers. Since there is no income heterogeneity within the urban group, the gini coefficients tend to zero in the long run.

5.3 The Effect of Performance on Polity

Having investigated the causation from polity to development and shown that democracy is a middle ground, we now address our two remaining questions: namely, whether higher income causes democracy and whether the calibrated model predicts a democratization date for England that is line with the historical record. For this purpose, we reintroduce uncertainty over autocrat type into the model and give the landed elites the power in each period to choose whether to democratize society.

Why would the landed elites in the model ever choose to democratize society? There are several forces at hand, the most important of which relates to how the elite fare under a democracy as the economy accumulates capital. Effectively, when the economy is poor and so most of an elite's income is in the form of land rents, democracy is extremely costly as the ruler taxes land at its maximum rate. As the economy develops, this tax has a smaller impact on elite utility because land rents represent a smaller component of elite income. Moreover, subsequent to industrialization, the democrat imposes a migration barrier, which is desirable from the standpoint of the elite. Thus, elite welfare under democracy starts off low, but increases rapidly as the economy develops.

Another force relates to changes in the probability that a given autocratic type rules the country as an economy develops. Recall that we assumed that the probability of drawing an elite autocrat is decreasing in aggregate bequests. The elite will democratize society as long as their welfare under democracy is greater than their expected utility under autocracy. Of course, the elite are happiest under an elite autocrat, so a reduction in the probability of drawing one of their own has the effect of reducing expected utility under autocracy. This makes it more likely that the elite will eventually democratize society.

[Figures 9a-b, 10a-b here]

To better understand these forces, we plot an elite's welfare under autocracy and democracy for extreme cases of autocratic realizations, one in which a good autocrat is drawn in all non-democratic periods and the other in which a bad autocrat is drawn in all non-democratic periods. Figures 9a and 10a plot the expected welfare of an elite household under autocracy and democracy for these two sequences of autocratic draws whereas Figures 9b and 10b break down expected utility into its three components[18]. Note that at the start of each period, the relevant state of the economy is the amount of parental bequests, which depends on the decision of the elite in the previous period whether to democratize, and the policy choices of the ruler in

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[18] We have also analyzed the case where the realizations are elite autocrats. We do not report the results in the text as they mimic the results for the bad realization economy.

that period. Whereas both economies start out with the same $t = 1$ conditions, the one which draws good autocrats is richer in all subsequent periods.

Both economies eventually democratize, although democratization happens two periods earlier in the richer country, (period 7 in the good autocrat realization economy and period 9 in the bad autocrat realization economy). For the reason given above, welfare under democracy rises rapidly from a low starting point for both economies. Expected welfare under autocracy displays a much slower rate of increase for both economies. As the welfare of the elite under a good autocracy and elite autocracy both increase at the same rate as welfare under democracy, the slower rate of increase of expected welfare under autocracy importantly reflects the decreasing probability of drawing an elite autocrat as the economy develops.[19]

We end this subsection by interpreting these results within the context of England's historical record. As we interpret England to have been ruled by good autocrats following its *Glorious Revolution*, the economy depicted in Figures 9a and 10a constitutes our model England. Democratization for this sequence of autocratic draws occurs in period 7, which given our first period corresponds to 1650, implies a democratization date of 1860. This is roughly the year that England extended the right to vote to better paid workers. Our calibrated model is thus consistent with England's political development. The model's ability to match this democratization date represents a successful test of our theory.

5.4 Sensitivity Analysis

We next turn to the question of how sensitive our results are to the choice of certain parameter values and modeling assumptions. In particular, we consider how our results depend separately on the persistence of Solow TFP barriers, the concentration of land holdings, and the probability function of drawing each autocratic type.

5.4.1 Temporary Solow TFP Barriers

In the benchmark economy, we assumed that a Solow TFP barrier permanently reduced the modern sector's productivity. We now relax this assumption so that the barrier lasts only in the period the policy is implemented. Namely, we now assume that $A_{st} = (1 - \pi_{st})(1 + \gamma_s)^t A_{s0}$ and recompute the equilibrium paths when polity is fixed and unchanged over time, and there is no decision by the elites over the political regime.

Figure 11 shows the per capita output paths of the four economies with fixed leader types. The relevant figure for comparison is Figure 5. As only the elite autocrat erects Solow TFP

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[19] Another force that is apparent in these figures is the slow rate of increase in welfare in the bad autocratic regime.

barriers, there is no difference in development paths for the democracy, good autocracy, and bad autocracy. The path for the elite autocracy is substantially altered, however. Specifically, with a temporary effect, the development path of the elite autocracy is very similar to the democracy. In fact, its per capita output is slightly higher and closer to the good autocracy.

The reason for this is better performance is straightforward. Even though the elite autocrat uses the TFP barrier to delay industrialization early on, eventually the elites benefit enough from industrialization that they would not want any such barriers in place. With no lasting effect, Solow TFP in the post industrialization period is just the frontier level, and hence output of the elite is near that of the good autocracy.[20]

[Figure 11 here]

5.4.2 More Equitable Distribution of Land

It is generally believed that a more equitable distribution of land is conducive to the process of democratization. For this purpose, we increase the size of the elite population holding the total initial resources of the landed elite and working population the same as before and explore the model's predictions for the coevolution of political regimes and development. It follows that each elite in the first period has a smaller initial bequest and a smaller land holding. Workers in contrast will have the same bequests in the first period. Despite this more equitable holding of land, we do not find any difference in democratization dates for the same history of autocratic rulers. The reason is that the change in the initial conditions has two opposing effects on the welfare of the elite under democracy. The reduction in land holdings per person implies that democratization is not as harmful to the elite as in the benchmark prior to industrialization, which works in the favor of hastening democratization. At the same time, with lower smaller capital holdings and capital income, the elite benefit less from industrialization, and hence democratization.

This neutrality result suggest that the mechanism whereby greater equity hastens democratization may be more related to politics than economics, and that we need to consider an alternative political structure to the model to generate this result. In particular, we might need to modify the model so that landed households are part of the lobbying group under democracy. Currently, of course, only workers, or subsets of them, lobby in democracy. If landed households were included in this group, then policy under democracy (both before and after

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[20] These two cases are extremes. An intermediate case would likely bring about a development path in between the extremes. In a more realistic model whereby elites were forward looking in their decisions, the intermediate case may be the one that most closely corresponds to the optimal choices. This is an interesting conjecture but one that is beyond the scope of the paper to analyze.

industrialization) would be closer to the one chosen by the elite autocrat. Hence, welfare of the landed class under democratization would be larger in all periods, and democratization would occur earlier. This is an interesting modification best left for future research.

5.4.3 Probabilities of autocratic types

As a final sensitivity check, we explore the implications for democratization of changing the function for the probability of drawing a bad autocrat. Recall, that in the benchmark experiment, the probability of drawing a good autocrat was constant whereas the probability of drawing a bad autocrat was an increasing and convex function of the economy's total bequests. We now consider two alternative formulations. In each, we maintain the assumption that the probability of drawing a good autocrat in each period is equal to .10. In one formulation, however, we assume that the probability of drawing the bad autocrat is an increasing, linear function of the economy's bequests whereas in the other we assume that the probability of drawing the bad autocrat is also constant and equal to .10.

How do these alternative assumptions affect the date at which the economy democratizes? In Figure 12a, we compare the welfare of the elite under autocracy and democracy for the linear case, i.e., when $Pr^B(B_{t-1}) = \min\{.85, 0.10 + 0.1B_{t-1}\}$ assuming that good autocrats are realized in each non-democratic period whereas Figure 12b repeats this assuming that a bad autocrat is drawn in each non-democratic period. The relevant comparison figures are Figures 9a and 9b. What we see is that the linear assumption delays the date of democratization in both economies. More importantly, we see that it also reduces the delay in democratization in the bad autocratic country from 2 periods in the benchmark to a single period. These experiments show that both the slope and curvature of the probability function for drawing a bad autocrat are important for the model to predict that history affects the timing of democratization.[21]

[Figure 12a-b here]

6 Conclusions

This paper puts forth a unified theory of economic and political development whereby an economy peacefully transits to democracy once it becomes sufficiently rich. It does so by adding a political layer to the unified growth theory of Hansen and Prescott (2002). The model accounts for the observation that in the postwar period democracies have not grown faster than autocracies on average, although they show smaller variation in growth experiences, and the

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[21] The results are similar for the constant probability case, except now there is no difference in democratization dates. For reasons of space, we do not include the corresponding plots.

observation that no long-lived autocracy is rich whereas every long-lived democracy is. Additionally, the model calibrated to the UK development experience is shown to correctly predict the UK's democratization experience.

There are a number of research areas to pursue. On the empirical side, this paper suggests that more work is needed in examining the distribution of polity across nations and how it has changed over time. Specifically, we would like to classify autocracies by type, namely, benevolent, elite, and kleptocratic, and use survival theory to estimate the probability of drawing each type of autocrat, as well as transitional probabilities. On the theoretical side, there are several areas to explore. One is to allow for forward looking behavior in the model. Another is to consider a similar array of policy choices in a different growth model where technological change is not modeled as exogenous as it is in Hansen and Prescott (2002). Given the paucity of papers that allow for the coevolution of polity and development and given the overwhelming evidence of causation in both directions, we think this is a fertile area of future research.

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Figures
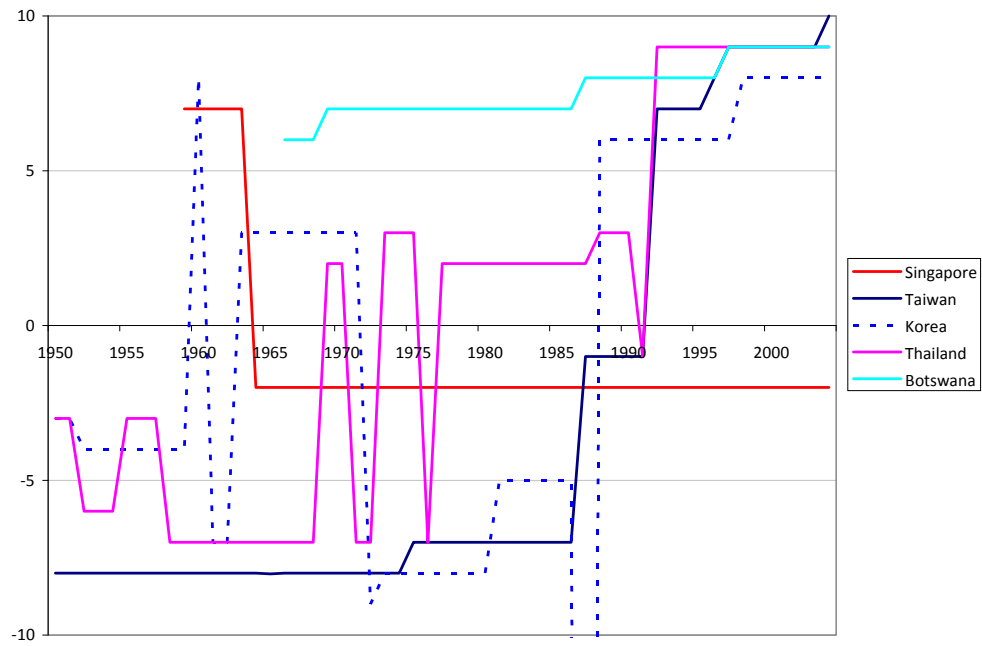
Figure 1: Polity indices of the five fastest growing economies 1960-2004.
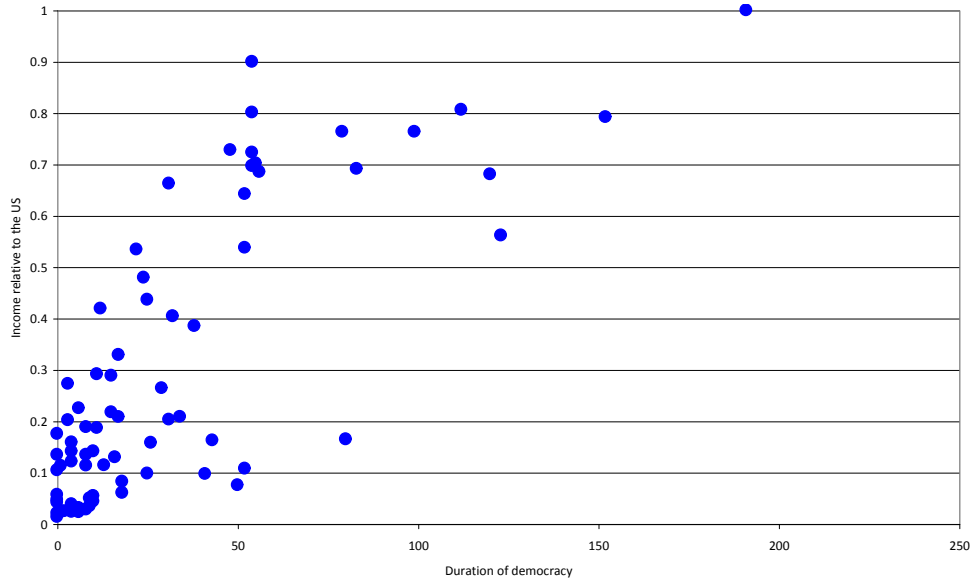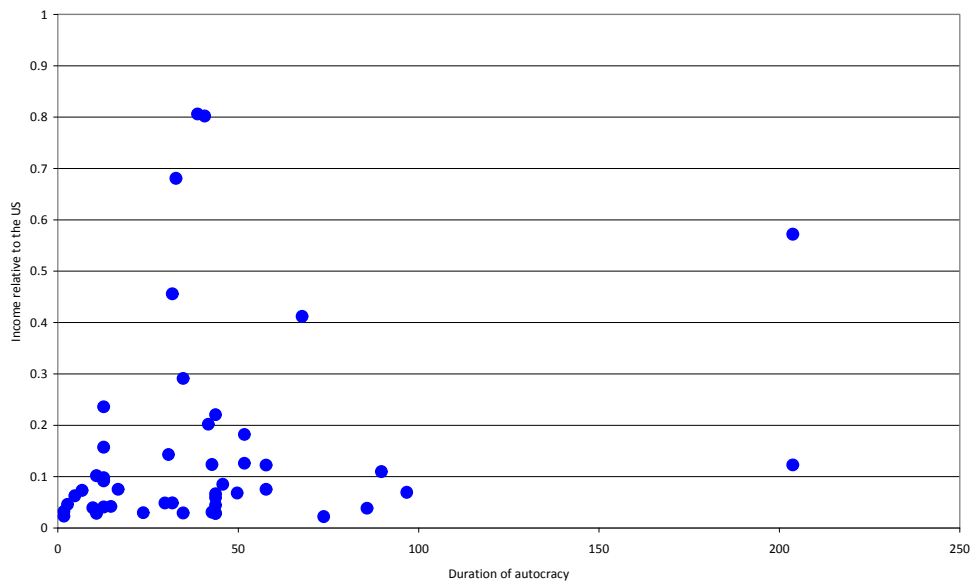
Figure 2: 2000 CGDP vs length of democracy.
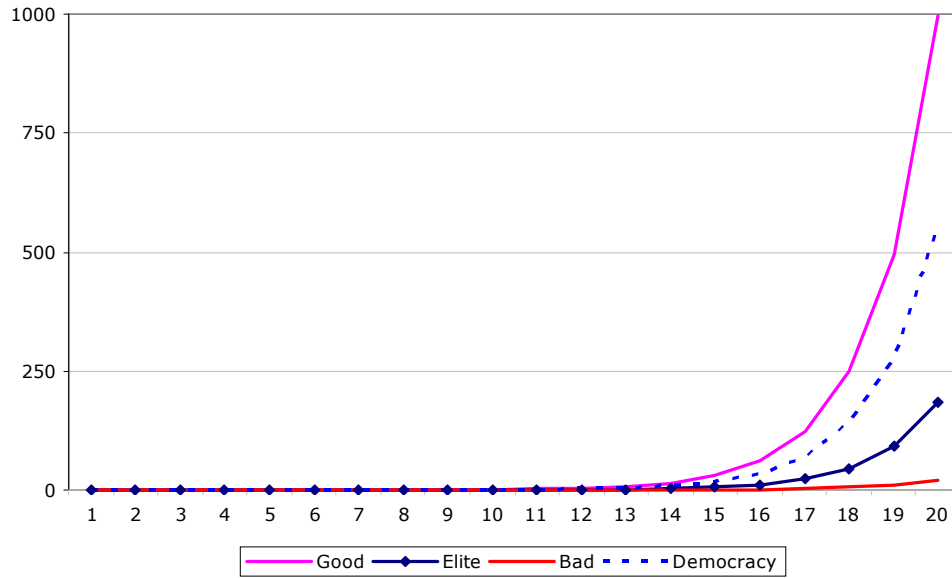

Figure 3: 2000 CGDP vs length of autocracy.

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Figure 4: Capital per capita in alternative political regimes. Permanent effects of barriers to Solow TFP.
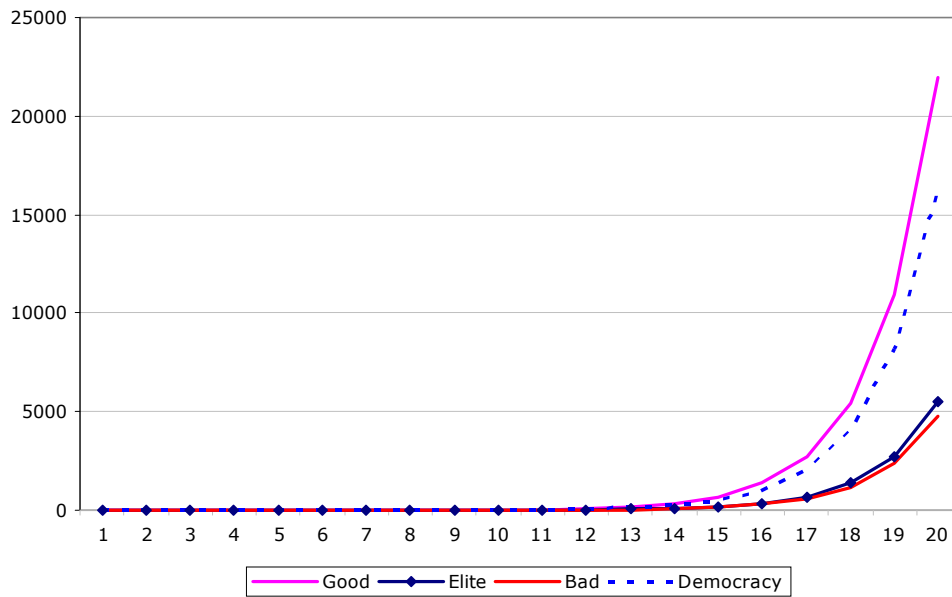

Figure 5: GDP per capita in alternative political regimes. Permanent effects of barriers to Solow TFP.
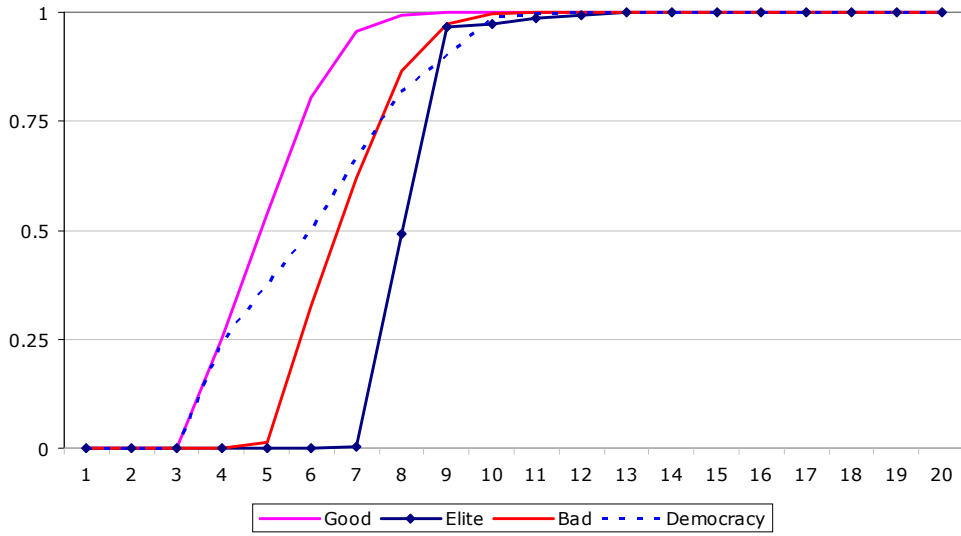
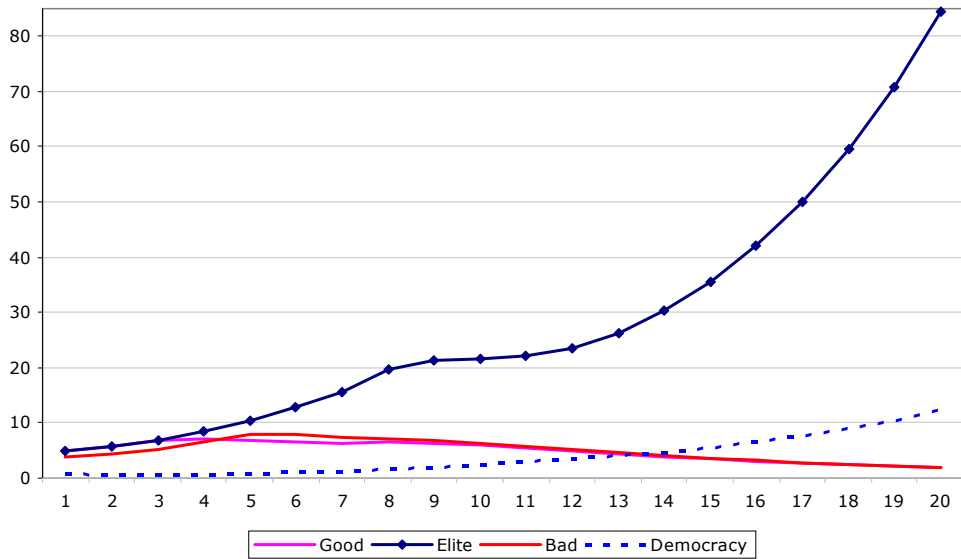Figure 6: Workers employed in urban areas as a share of total labour force.

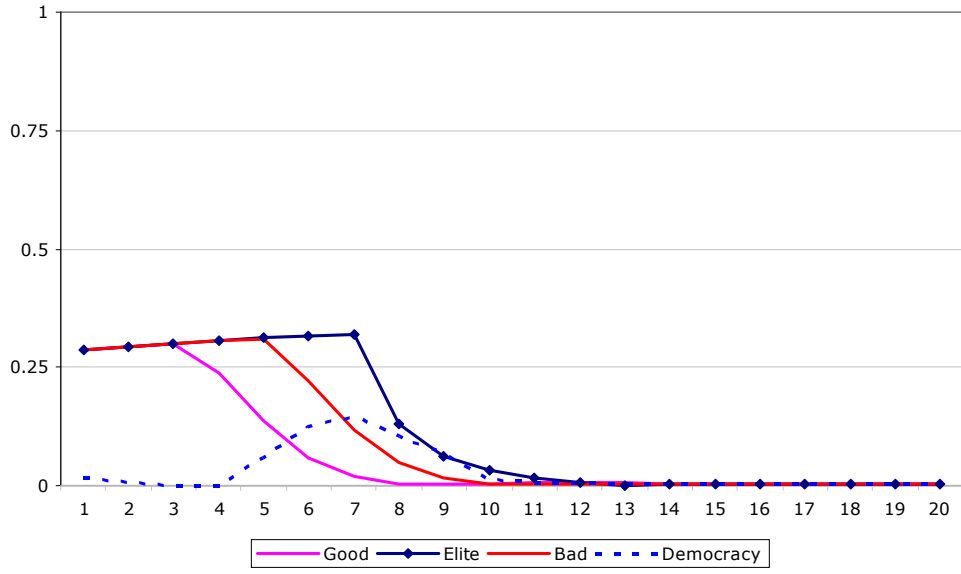Figure7: Income of the elite in alternative regimes.

Figure 8: Gini-coefficients in alternative political regimes.

Figure 9a: Expected utility of the landed elite of autocracy and democracy. Probability of drawing a bad autocrat convex in capital. Good draw.

Figure 9b: Expected utility of the landed elite of alternative regimes. Probability of drawing a bad autocrat convex in capital. Good draw.
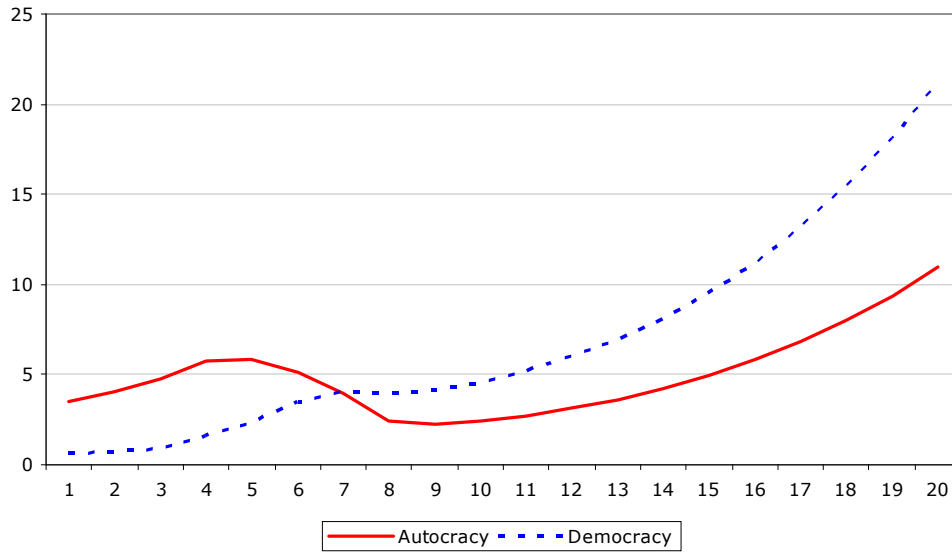
Figure 10a: Expected utility of the landed elite of autocracy and democracy. Probability of drawing a bad autocrat convex in capital. Bad draw.
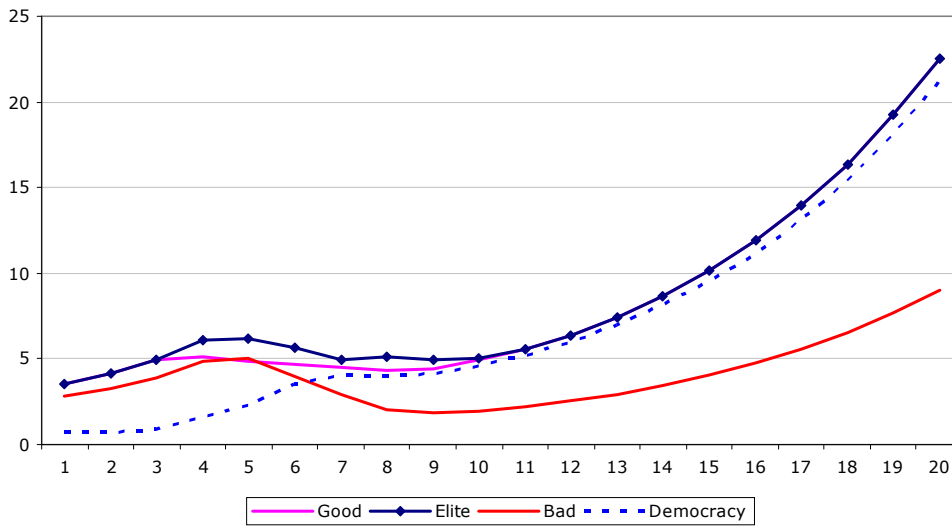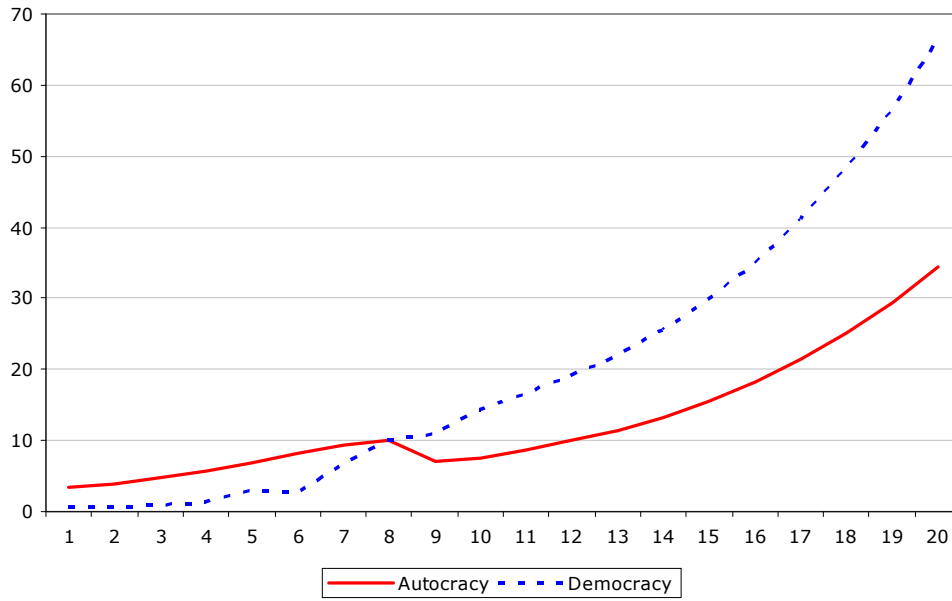

Figure 10b: Expected utility of the landed elite of alternative regimes. Probability of drawing a bad autocrat convex in capital. Bad draw.

Figure 11: GDP per capita in alternative political regimes. Temporary effects of barriers to Solow TFP.

Figure 12a: Expected utility of the landed elite of autocracy and democracy. Probability of drawing a bad autocrat linear in capital. Good draw.

Figure 12b: Expected utility of the landed elite of autocracy and democracy. Probability of drawing a bad autocrat linear in capital. Bad draw.
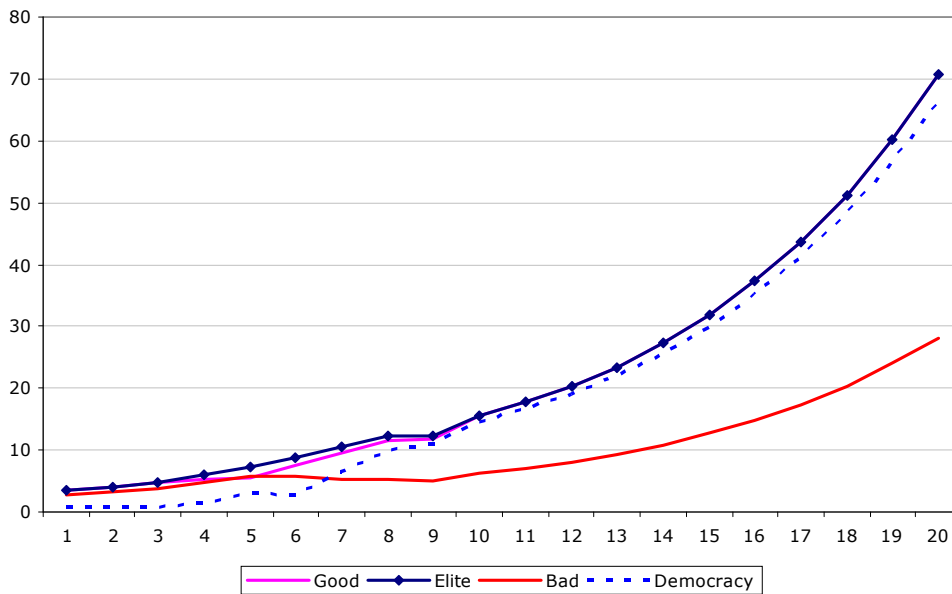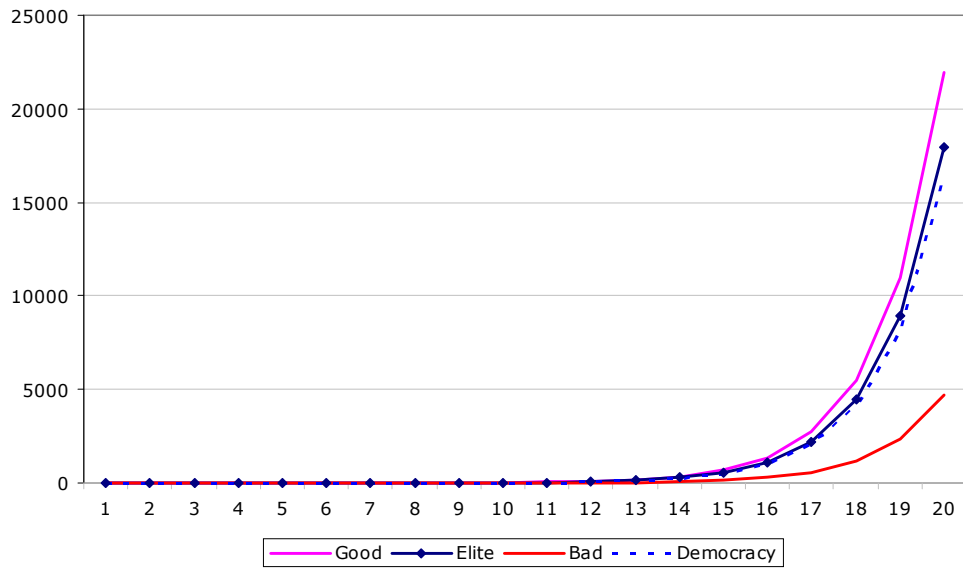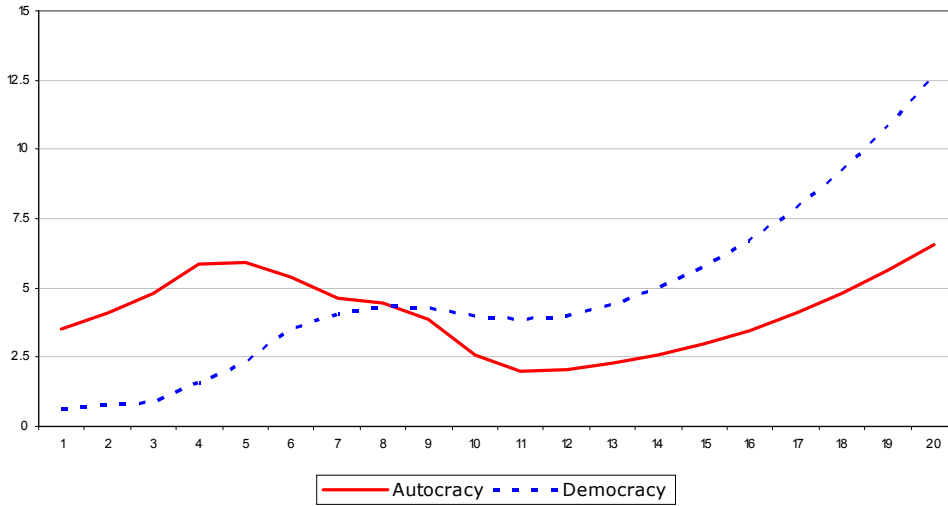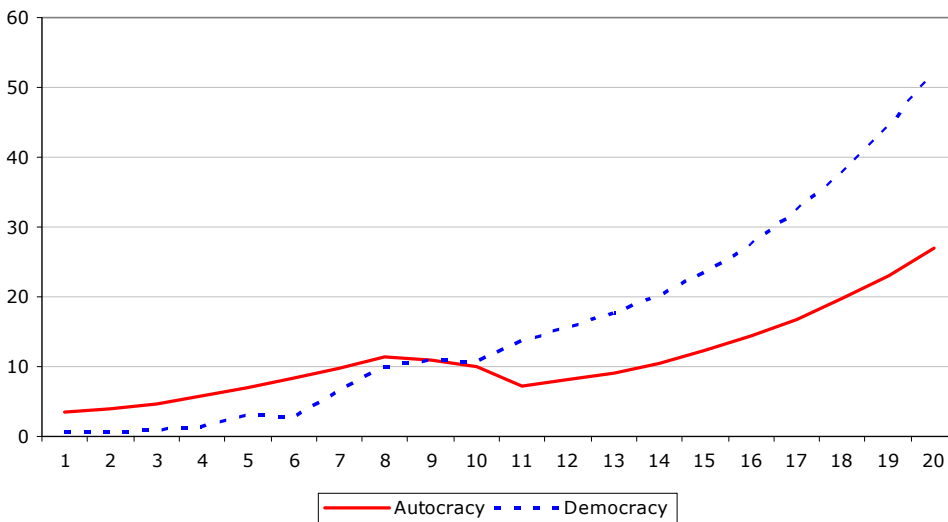
Tables

Table 1: Optimal policy under alternative (fixed) political regimes.

Parameter	Value	Comment
ϕ	.60	historical estimates of land's share as used in Hansen and Prescott (2002)
ψ	.10	historical estimate of capital's share of income used in Hansen and Prescott (2002)
γ_m	.032	average annual TFP growth rate of .3% per year pre-1700 as in Hansen and Prescott (2002)
A_{m1}	1.0	normalization
θ	.40	capital's share of income since 1900
γ_s	.518	average annual real GDP-growth of 2% per year since 19000
A_{s1}	.50	industrialization starting date 1750
N_1	1.0	normalization
N_{e1}	.05	fraction of nobles in Western Europe in medieval period
B_{e0}	.45	ensures non-decreasing capital stock and roughly constant rental prices of land and labor in Malthusian era
B_{e1}	.04	ensures non-decreasing capital stock and roughly constant rental prices of land and labor in Malthusian era
μ	.90	expenditures on consumption equal to 90% of household income
f	.10	10% of time spent on lobbying/political activities

Table 2: Optimal policy under alternative (fixed) political regimes.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Good																				
π_{ut}	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
π_{bt}	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
π_{lt}	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
π_{st}	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Solow[a]	N	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Elite																				
π_{ut}	0	0	0	.50	.80	.80	.80	0	.50	.70	.80	.80	.80	.80	.80	.80	.80	.80	.80	.80
π_{bt}	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
π_{lt}	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
π_{st}	0	0	0	0	0	.30	.30	0	0	0	0	0	0	0	0	0	0	0	0	0
Solow	N	N	N	N	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Bad																				
π_{ut}	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
π_{bt}	.90	.90	.90	.90	.90	.90	.90	.90	.90	.90	.90	.90	.90	.90	.90	.90	.90	.90	.90	.90
π_{lt}	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
π_{st}	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Solow	N	N	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Democracy																				
π_{ut}	0	0	0	0	.40	.60	.70	.80	.80	.80	.80	.80	.80	.80	.80	.80	.80	.80	.80	.80
π_{bt}	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
π_{lt}	.90	.90	.90	.90	.90	.90	.90	.90	.90	.90	.90	.90	.90	.90	.90	.90	.90	.90	.90	.90
π_{st}	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Solow	N	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

[a] Indicates if the Solow technology is in use: Yes (Y) or No (N).

Appendix

Democracy

Suppose that the elite decide to democratize the country. The timing is then as follows.

1. One candidate is randomly drawn from the lobbying group, denoted A, and one candidate from the non-lobbying group denoted B.

2. The two candidates commit to a policy platform $\Omega^c = (\pi_u^c, \pi_b^c, \pi_l^c, \pi_s^c, g^c)$ for $c = A, B$.

3. The lobbying group 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^c 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 government budget constraint. Each candidate thus 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 $W_h(\Omega^c)$ denote the indirect utility of a voter of type $h = A, B$ as a function of the policy associated with candidate c. The ideological preferences of a voter i of type h are a random variable, denoted σ_{ih} and uniformly distributed on $\left[-\frac{1}{2\phi}, \frac{1}{2\phi}\right]$. Voters in the two groups have identical ideological preferences for candidates A and B which implies that the support of σ_{ih} is the same for the two groups. A voter in group h prefers candidate A if

$$W_h\left(\Omega^A\right) > W_h\left(\Omega^B\right) + \sigma_{ih} + \delta \tag{22}$$

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

$$\delta = \widetilde{\delta} + \mu\left(C^B - C^A\right)$$

where $\mu > 0$, C^c denotes campaign contributions received by candidate c and $\widetilde{\delta}$ is inherent relative popularity of candidate B, uniformly distributed on $\left[-\frac{1}{2\psi}, \frac{1}{2\psi}\right]$. The swing voter in group h is by definition indifferent between candidates B and A so that (22) holds with equality, i.e.

$$\sigma_h = W_h\left(\Omega^A\right) - W_h\left(\Omega^B\right) + \mu\left(C^A - C^B\right) - \widetilde{\delta} \tag{23}$$

Clearly, all voters with $\sigma_{ih} \leq \sigma_h$ also prefer candidate A to candidate B. Let χ_h denote the relative size of group h, i.e. $\chi_A = \chi$ and $\chi_B = 1 - \chi$. This implies that the vote share of candidate A, Ω^A, is given by:

$$\Omega^A = \sum_h \chi_h Prob\left(\sigma_{ih} \leq \sigma_h\right)$$

By the uniform distribution of σ_{ih}:

$$Prob\left(\sigma_{ih} \leq \sigma_h\right) = \phi\left(\sigma_h + \frac{1}{2\phi}\right)$$

which implies:

$$\Omega^A = \phi\sum_h \chi_h Prob\left(\sigma_h + \frac{1}{2\phi}\right)$$

Since the threshold value for the swing voter, σ_h, depends on the stochastic parameter $\widetilde{\delta}$ according to (23), the vote share Ω^A is a stochastic variable. The probability of candidate A winning the election as a function of the

campaign contributions can be derived as follows:

$$p^A = Prob\left(\Omega^A \geq 1/2\right) = Prob\left(\phi \sum_h \chi_h \sigma_h \geq 0\right)$$

since $\sum_h \chi_h = 1$. Substituting for σ_h implies:

$$p^A = \frac{1}{2} + \psi\left(W\left(\Omega^A\right) - W\left(\Omega^B\right) + \mu\left(C^A - C^B\right)\right) \tag{24}$$

where $W\left(\Omega^c\right) = \sum_h \chi_h W_h\left(\Omega^c\right)$ is the utilitarian social welfare function and $C^A = \chi C_A$. The probability that candidate A wins the election is increasing in the social welfare associated with the candidate's platform and in campaign contributions C^A.

Next, consider the optimal contributions of the lobby. We assume that members of the lobbying group are organized in one single lobby, seeking to maximize the expected utility of its members subject to a quadratic cost function. The lobby can contribute to both candidates' campaigns and decides on C_A, how much each member of the lobby must contribute to each of the two candidates:

$$\max_{C_A, C_B} p^A W_A\left(\Omega^A\right) + \left(1 - p^A\right) W_A\left(\Omega^B\right) - \frac{1}{2}\left[\left(C_A^A\right)^2 + \left(C_A^B\right)^2\right]$$

subject to (24), taking the platforms Ω^A and Ω^B as given. The first-order conditions are given by:

$$\alpha\psi\mu\left[W_A\left(\Omega^A\right) - W_A\left(\Omega^B\right)\right] - C_A = 0$$
$$-\alpha\psi\mu\left[W_A\left(\Omega^A\right) - W_A\left(\Omega^B\right)\right] - C_B = 0$$

This implies:

$$C_A = \max\left\{0, \alpha\psi\mu\left[W_A\left(\Omega^A\right) - W_A\left(\Omega^B\right)\right]\right\} \tag{25}$$
$$C_B = -\min\left\{0, \alpha\psi\mu\left[W_A\left(\Omega^A\right) - W_A\left(\Omega^B\right)\right]\right\}$$

The lobby therefore chooses to contribute only to the campaign of candidate A as long as $W_A\left(\Omega^A\right) - W_A\left(\Omega^B\right) > 0$.

The two candidates anticipate that the lobbying group will choose contributions according to (25). 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 both aim to please the lobbying group.

Recall that candidates maximize the probability of being elected. From (25) we know that only candidate A will receive contributions. Using the definition of the social welfare functions in (24), substituting for equilibrium contributions (25), using the fact that $C^A = \chi C_A$ and simplifying, the objective function of candidate A, V^A, can be written:[22]

$$\max_{\Omega^A} V^A = \chi\left(\psi + (\psi\mu)^2\right) W_A\left(\Omega^A\right) + \psi(1 - \chi) W_B\left(\Omega^A\right)$$

The first-order condition is:

$$\chi\left(\psi + (\psi\mu)^2\right)\frac{\partial W_A}{\partial \Omega_A} + \psi(1 - \chi)\frac{\partial W_B}{\partial \Omega_A} = 0 \tag{26}$$

Since both candidates will choose the same platform, $\Omega^A = \Omega^B \equiv \Omega^D$, we may write

$$\Omega^D = \left(\pi_u^D, \pi_b^D, \pi_l^D, \pi_s^D g^D\right) = \arg\max V^A$$

In our model, we assume that prior to the period of industrialization t^*, rural workers are lobbying while the lobbying power is shifted to the urban workers in the modern era. In the numerical experiments, the working

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[22] The probability that candidate A wins the election is given by:

$$p^A = \chi\left(\psi + (\psi\mu)^2\right) W_A\left(\Omega^A\right) + \psi(1 - \chi) W_B\left(\Omega^A\right) + g(\Omega^B)$$

where $g(\Omega^B) = 1/2 - \psi(\chi W_A(\Omega^B) + (1 - \chi) W_B(\Omega^B) + \chi(\psi\mu)^2 W_A(\Omega^B))$.

class constitute more than 95 percent of the population, implying that the population share of the lobbying group, χ, is close to one at all times. Since this implies that almost no weight is assigned to the non-lobbying group according to (26) and we lack a prior for how to set ψ and μ, we simply assume that the objective of the democratic policy maker coincides with that of the lobbying group, i.e.

$$V^D = \begin{cases} W_{rt} \ if \ t \leq t^* \\ W_{ut} \ if \ t > t^* \end{cases}$$

Probability of Bad Autocrat

Suppose that population of elites is the set of possible autocratic rulers in the period. Assume that a certain measure of these agents are saintly and thus never consider the possibility of being a kleptocrat or elite ruler. Without loss of generality, assume that the measure of non-saintly elites are uniformly distributed on the unit interval. Preferences of these elite differ in how much each values consumption in the company of other elite. In particular, assume that non-saintly elite are indexed by a social class preference parameter $\zeta^i \in [0,1]$. An elite household that becomes the nation's leader has the choice of being an elite autocrat or a kleptocrat. If the leader chooses to be a kleptocrat, he is ostracized from his social class, which reduces the utility of private consumption. More specifically, his utility if he chooses the kleptocratic route is

$$u(c_{it}, B_{it}) = [(\zeta^i)^{1/\eta} c_{jt}]^\mu B_{jt}^{1-\mu}$$

where $\eta > 0$.

Otherwise, if he chooses to be an elite autocrat, he is not socially ostracized and hence his utility is

$$U(c_{it}, B_{it}) = c_{jt}^\mu B_{jt}^{1-\mu}$$

The presence of the social class parameter, ζ, does not affect the allocation of the leader of his income between his own consumption or bequests. He continues to allocate fraction μ of his income on his own consumption and the remainder on bequests.

The income of the ruler will differ depending on whether he is a kleptocratic ruler or an elite ruler. In the case of a kleptocrat, his income is

$$I_{bt} = r_{lt}(b)l_{et} + r_{kt}(b)k_{et}(b) + \pi_b B_{t-1}$$

and in the case he is an elite ruler his income is

$$I_{et} = r_{lt}(e)l_e + r_{kt}(e)k_{et}(e)$$

Given the optimal consumption and bequest decision, it follows that an elite household will choose to be a bad autocrat if

$$(\zeta^i)^{\mu/\eta} I_{bt} \geq I_{et}$$

or,

$$\zeta^i \geq \left(\frac{I_{et}}{I_{bt}}\right)^{\eta/\mu}$$

With elite types being distributed uniformly on the [0,1] interval, the probability that an elite (non-saintly) household will be a kleptocratic ruler is $Pr_t(b) = 1 - Pr(\zeta^i < \zeta)$ which is equal to

$$1 - \left(\frac{I_{et}}{I_{bt}}\right)^{\eta/\mu}$$

Assume that $\partial I_{bt}/\partial B_{t-1} > 0$. Then

$$\frac{\partial \Pr}{\partial B_{t-1}} = \frac{\eta}{\mu} \left(\frac{I_{et}}{I_{bt}}\right)^{(\eta/\mu)-1} \frac{\partial I_{bt}}{\partial B_{t-1}} > 0$$

Thus the probability of obtaining a kleptocratic leader is an increasing function of the economy's wealth. The second derivative is

$$\frac{\partial^2 \Pr}{\partial B_{t-1}^2} = \frac{\eta}{\mu} \left(\frac{\eta - \mu}{\mu}\right) \left(\frac{I_{et}}{I_{bt}}\right)^{(\eta/\mu)-2} \frac{\partial I_{bt}}{\partial B_{t-1}} + \frac{\eta}{\mu} \left(\frac{I_{et}}{I_{bt}}\right)^{(\eta/\mu)-1} \frac{\partial^2 I_{bt}}{\partial B_{t-1}}$$

The probability of the autocrat being a kleptocrat is convex if the second derivative is positive. A sufficient condition for $\partial^2 \Pr / \partial B_{t-1}^2 > 0$ is $\eta > \mu$ and $\partial^2 I_{bt}/\partial B_{t-1} > 0$.