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Political Instability and Growth in Dictatorships*

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Abstract

We model growth in dictatorships facing each period an endogenous probability of "political catastrophe" that would extinguish the regime's wealth extraction ability. Domestic capital exhibits a bifurcation point determining economic growth or shrinkage. With low initial domestic capital the dictator plunders the country's resources and the economy shrinks. With high initial domestic capital the economy eventually grows faster than is socially optimal.

Keywords: Dictatorship, Growth, Political Stability, Plunder

Introduction

Sah (1991) likens the choice of dictatorship to that of a risky asset because some grow very rapidly while others fail miserably. Robert Barro, in "Getting It Right," (1996b, p.3), expresses the similar view that dictators

> "come in two types: one whose personal objectives often conflict with growth promotion and another whose interests dictate a preoccupation with economic development....The theory that determines which kind of dictatorship will prevail is missing."

We actually provide such a theory that fits into the rational choice approach to the analysis of dictatorships initiated in Wintrobe (1990) and further developed in Wintrobe (1998). The dictators in our model come in exactly the two types Barro proposes. One forces a growth rate that is too high relative to the social optimum. The other type presides over stagnation or even plunders the economy into the ground. The determination of dictatorial type is endogenous. That is, we provide an intuitively appealing theory that determines whether a dictatorship grows or declines and that compares its performance with optimal behavior, finding a particularly high variability in growth rates in dictatorships.

Political instability is a major impediment to economic growth in a wide variety of countries (Barro 1991, Alesina, Ozler Roubini and Swagel 1996). Instability, implying risk, limits investments and hence growth. Moreover, since physical capital is becoming increasingly mobile across countries and regions, the role of political instability in economic decision making is likely to increase as foreign investment and capital flight respond ever more sensitively to changes in countries' political environments. footnote

While the above considerations are standard, in this paper we introduce the more novel assumption that domestic capital development contributes to political stabilization while domestic capital deterioration causes political destabilization. The idea underlying this relationship is that domestic capital development increases the number and influence of individuals with an interest in the continuance of the current political status quo, stabilizing the system. footnote

The dictator in our model maximizes the discounted present value of his own consumption while he remains in office while his stochastic and endogenous survival process is determined by political stability, which evolves over time. This notion of dictatorship corresponds closely to the concept of "tinpot dictatorship" of Wintrobe (1990, 1998). Wintrobe's tinpot dictator takes as much wealth as possible subject to staying in power. We do not claim this is the only interesting kind of dictatorship. Wintrobe also emphasizes what he calls "totalitarian dictatorships" which strive to maximize their power. footnote However, we do believe that there are not many dictatorships that do not display a significant tinpot element.

We contrast the dictator's behavior with that of a social planner. There are two differences between the two decision makers. First, the dictator suffers a penalty if he is overthrown while the latter is indifferent to political upheavals. Second, the dictator's behavior is driven by the fraction of output he skims off, while in the socially planned economy nothing is skimmed off and the planner is concerned with overall consumption. footnote

Our first result is that in dictatorships there are only three possible qualitative paths for domestic capital: steady growth, steady decline, or zero growth, a knife-edge case. footnote In particular, a "U-shape" scenario under which domestic capital first deteriorates and then reverses course cannot occur. There is a straightforward intuition underlying this result. Domestic capital deterioration decreases stability, worsening the conditions for domestic capital investment, leading to further deterioration, completing a vicious cycle. Under these conditions the dictator aggressively plunders the country's resources, even while realizing that in doing so he hastens his departure from power and, hence, his ability to continue extracting wealth. The key insight here is that in an unstable environment the dictator expects to remain in power for only a short period, regardless of his strategy, so plundering dominates investment.

On the other hand, there is a self-reinforcing cycle underlying steady growth that has mirror-image intuition: domestic capital growth increases stability, improving the conditions for increased domestic capital investment leading to further growth, completing a virtuous circle. In this case, the dictator is restrained in his wealth extraction to lengthen the time he will enjoy the benefits of continued power. In particular, more investment leads to more stability, extending the dictator's effective time horizon. Note that a dictator with a below-bifurcation capital stock does have the option of pursuing rapid, and stabilizing, growth. It is just not optimal to do so because he would already be ousted with high probability before he could reach a region of reasonably high stability.

A central and related result is that if the economy begins with sufficient domestic capital to promote political stability there is steady growth; otherwise, there is steady deterioration. In other words, there is a critical level of domestic capital which we will refer to as a "bifurcation point": an economy below this level finds itself in a development trap whereas one above the threshold follows a plan of steady growth. footnote

We analyze how the bifurcation point depends on the underlying parameters. It is decreasing in the dictator's discount factor and the ex ante probability of remaining in office. These results make sense; a more patient or stable dictator should be more willing to pursue growth than a less patient or stable one. footnote The bifurcation point is also decreasing in the depreciation rate, i.e., faster depreciation presents an increased threat to political stability that our dictators address directly through an enhanced tendency to grow. Increasing the penalty to the dictator for losing power also decreases the bifurcation point; since growth stabilizes the dictator's position a strong fear of losing power is a positive factor for growth. Another way to view the same result is that dictators who are skimming a large fraction of their economy's consumption are more willing to grow than those who are skimming less because the former have more to lose from leaving office than the latter. This fits well with the theory of dictatorships developed in McGuire and Olson (1996) and particularly Olson (2000), according to which a dictator with a more "encompassing" interest, i.e., one who is taking a larger fraction, will be more willing to promote growth than one with a less encompassing interest. This point is not obvious because dictators who are skimming a large fraction of total consumption might be expected to set high consumption levels, hindering growth. However, it turns out that this effect is dominated by the desire to survive as long as possible in power.

The shape of the policy function, giving the fraction of output consumed as a function of domestic capital, is of interest. The consumption fraction follows two possible paths. On the first it starts high, eventually falls and then once again increases. On the other path it falls even at low values of capital and then rises. This indicates that at an early stage of development dictatorships increase their saving rates as they grow richer. This result provides insight into the rapid growth experience of the Asian Tiger economies that did indeed have declining consumption rates during their takeoff phases (World Bank 1993. pp. 40-42).

We explore the differences between the dictator's and social planner's behavior. The most glaring distinction is that the social planner does not exhibit bifurcation. In fact, for the parameters we consider the social planner always grows. footnote Next, for sufficiently high domestic capital dictatorships grow faster than their corresponding social planner economies. The intuition is that a dictator expects high growth rates to prolong his tenure in power. Thus, when a dictator chooses growth, he will eventually choose *rapid* growth in order to increase the longevity of his rule. footnote On the other hand, dictatorships below the bifurcation point shrink when, with the same endowment, social planners grow. This reveals a tendency for dictators to plunder their countries' wealth when their hold on power is insecure. We also find that the variability of growth rates for our dictators is higher than for our social planners.

These results have interesting connections with some common ideas on growth and dictatorship. First, one often encounters the view that corrupt regimes have a strong tendency to decline. footnote But, within our framework this is not necessarily the case. Below the bifurcation point our regimes, which are by nature corrupt in the sense that they appropriate national wealth for themselves, do indeed decline rapidly. But sufficiently above bifurcation they grow very rapidly. This is not to say that our results would support a view that dictatorships are socially optimal. In fact, our model dictatorships do not choose socially optimal growth rates, but they may experience excessively rapid growth. A second common view is that insecure dictators will tend to plunder their economies into decline (e.g. Olson, 1991, 1993). Again, this is true only below bifurcation in our model. It is true that instability leads to what we call a "horizon-shortening effect" that operates against growth in all cases. But at the same time there is also an "endogenous-survival effect" that works in the opposite direction. Since rapid investment shifts to the right the probability distribution over the dictator's time in power, there is a tendency for overinvestment by moderately insecure dictators. In other words, a desire to stabilize his position might lead a dictator to favor rapid growth.

Robinson (1997) studies exactly the same question as we do, namely when does a state promote development and when does it simply prey off the population? The key tradeoff in this work is that development expands the pie from which a state can siphon off resources but also can make it easier for opposition to organize against the state. A good example of the issue is building roads; roads are good for development but also can be used for subversive activity. Interestingly, in this theory patient dictators can be among the least development-oriented because they are the most averse to the possible future political destabilization that public investment could cause. We believe this work gives very important insights, particularly into the large number of corrupt regimes that have stagnated and deteriorated over time. However, we also think that many important cases fit into our complementary approach that treats growth as stabilizing rather than destabilizing. In fact, many Asian regimes in particular seem to derive their legitimacy mainly from their ability to deliver economic growth (Campos and Root 1996,World Bank, 1993). footnote We will return to Robinson (1997) several times below.

Wintrobe (1990, 1998) provides a general theory of dictatorships of all possible types. The main concern in this work is how dictators maintain power through the use of repression, economic growth and distribution of rents. Wintrobe also considers how economic growth affects the dictator's optimal use of repression.. Although we do not consider repression here, our idea of stabilization through growth, underpinned by the enhanced opportunities for co-optation of potential opposition that growth affords, are very much along the lines of Wintrobe's thinking. However, Wintrobe's analysis does not delve into the mechanics of the growth process and, therefore, is unable to do, e.g., the sorts of comparisons between the growth rates of dictatorships and social planners that feature centrally in our work.

Marcouiller and Young (1995) provide an interesting static model of a predatory state showing how, through general equilibrium effects, the threat that economic activity will withdraw into the informal economy to avoid corrupt taxation can be very weak. They give circumstances under which it can be rational for a dictator to tax the formal sector very heavily while simultaneously providing virtually no public goods. This work is, however, concerned solely with negative outcomes and also does not study dynamics.

The plan of the paper is as follows. In section two we present the model. We give the main results and analysis in section three. Section four contains comparative statics, interpretations and policy considerations. We conclude in section four.

The Model

Production

The economy's production function is

$$F_t \qquad K_t J_t^{1} \qquad \#$$

where K_t is domestic and non-mobile capital and J_t is foreign and fully-mobile capital at time t respectively and where $t \quad 1, 2, \ldots$ is measured in discrete intervals. We think in terms of a broad concept of domestic capital that goes beyond traditional physical capital to include physical infrastructure (roads, bridges, telephone lines etc.), market infrastructure (stock, bond, and derivatives markets, banks, a functioning legal system etc.), and human capital. Foreign capital is complementary to domestic capital and includes such factors as advanced technology, sophisticated physical capital and modern managerial skills – factors of production not readily available in the domestic economy.

Foreign Investment

We assume a small open economy, i.e., foreign investment flows into or out of the country until its domestic return is equal to a fixed world rate of return, . footnote Therefore $\frac{F_t}{J_t} \qquad 1 \qquad J_t \;\; K_t$. Solving for J_t yields

$$J_t \quad \left(\frac{1}{\qquad}\right)^{\frac{1}{\;}} K_t \qquad \#$$

The Rate of Return on Domestic Capital

Domestic capital earns its marginal product, so that its rate of return w_t is

$$w_t \quad \frac{F_t}{K_t} \qquad J_t^{1} \;\; K_t^{\;\;1} \qquad ^{\frac{1}{\;}} \left(\frac{1}{\qquad}\right)^{\frac{1}{\qquad}} \qquad \#$$

Since it turns out that w_t does not vary over time, we define $w \quad w_t$ so as not to unnecessarily carry the t subscript through all the calculations. Gross domestic earnings are wK_t and are decreasing in the world rate of return. Note that the production function is homogeneous of degree one so, using Euler's theorem, $F_t \qquad K_t J_t^{1} \qquad wK_t \quad J_t$.

Domestic Capital Development

Let C_t denote consumption and define investment as I_t where $I_t \quad wK_t \quad C_t$. The difference equation governing domestic capital evolution is

$$K_{t\;1} \qquad 1 \qquad K_t \quad I_t, \qquad \#$$

where $0 \qquad 1$ is the rate of decay of capital. This formulation builds some persistence into the domestic capital stock while requiring investment if the stock is to be maintained or increased.

Political Catastrophes

A key feature in the model is that in every period there is an endogenous probability of a political catastrophe that removes the dictator from power. Conceptually, we consider that overthrow is likely when the government fails to satisfy certain active power groups, which must be paid off or kept happy through targeted investments. The money to pay these interests may come from taxes which are a fraction of output wK_t, or it may come from more militant appropriation of capital; in either case the availability of funds is proportionate to K_t. The probability of a catastrophe in period t, given that one has not yet occurred, is modeled accordingly as

$$q_t \quad q\ K_t \quad \min\ e^{\quad K_t}, 1 \qquad \#$$

where 0. footnote This is the probability that the dictator is not in power during year t 1 given that he was in power during year t. Thus, the transition out of power occurs at the end of year t. In the computations is chosen so that K_t 0 for all plausible values of K_t. With greater domestic capital, equation (2.5) then implies that the dictator is able to satiate the demands of a greater number of participants in the active power groups. By increasing their satisfaction with the status quo, the dictator reduces the chance of being overthrown through political revolution. footnote

To elucidate the meaning of political catastrophe, we offer the following examples. The key issue is whether or not the overthrow of a dictator leads to a substantial cut in an elite's ability to extract resources from the economy. Communist revolutions would always qualify as political catastrophes, because they curtail the ability of the overthrown elite to enjoy the benefits of power. Some coups bring about real turnover in elites and would, therefore, qualify as political catastrophes. Other coups amount to a reshuffling of titles and would not be political catastrophes in our terms. The sudden democratization of Eastern Europe probably would be a political catastrophe, although many would argue that their was much less elite turnover than is commonly supposed.

Objective of the Policymaker

We are interested in the behavior of a dictatorship concerned with the portion of domestic consumption it takes in every period up until a catastrophe point – if one occurs. The dictator chooses the split of output between consumption and investment, but not his level of consumption relative to the average citizen's consumption. Consumption for the dictator is C_t where 0 1. The dictator's utility in period t is

$$U_t \quad \left\{ \begin{array}{ll} \frac{C_t \ \ 1}{1} & \text{if} \quad 1 \text{ and in power} \\ \ln \quad C_t & \text{if} \quad 1 \text{ and in power} \\ U_{\min} & \text{if not in power} \end{array} \right\} \qquad \#$$

where 0 is the coefficient of relative risk aversion. The last line reflects the key fact that the dictator is penalized for losing power. $U_{\min}$ and are taken as parameters that are varied in the computations to reflect different penalties for losing power. $U_{\min}$ in the computation is chosen so that for any reasonable capital stock utility in power is higher than utility out of power.

Assuming a discount factor of 0 1 and subject to equations 2.1 2.6, the dictator's problem can be written as

$$\max_{C_t \ \ t\ 1} E \quad {}^{t}U_t \quad \frac{1}{1} U_{\min} \qquad \#$$
$$t\ 1$$

where is a random variable with range $1, 2, \ldots$ giving the stochastic and endogenous time when the catastrophe occurs. An equivalent formulation for the problem is

$$\max_{C_t \; t\,1 \quad t\,1} E \quad {}^{t}\left\{\left[\;{}^{t}_{1}\; 1 \quad q\; K \;\right] U\; C_t \quad \left[1 \quad {}^{t}_{1}\; 1 \quad q\; K\;\right] U_{\min}\right\} \qquad \#$$

where ${}^{t}_{1}\;1 \quad q\;K$ is the endogenous probability that the dictator is in power at time t and $1 \quad {}^{t}_{1}\;1 \quad q\;K$ is the endogenous probability that the dictator is not in power at time t. These products are built up inductively using the law of conditional probability, i.e., if ${}^{t\;1}_{1}\;1 \quad q\;K$ is the probability that the dictator survives until period $t \quad 1$ then we multiply this probability by $1 \quad q\;K_t$, namely the probability of surviving until period t given survival until period $t \quad 1$, to obtain the probability of survival until period t.

Next, as a basis for comparison, we consider the problem of a benevolent social planner. This problem coincides with the dictator's problem, but with one key difference; the social planner does not view political catastrophe as terminating high utility. The difference between the criteria of the social planner and the dictator is that the dictator weighs a given future period's utility by the probability of avoiding catastrophe up to that point, while the social planner takes into account the path of the economy after catastrophe. After a political upheaval, the economy continues on with different leadership but still provides utility to the population. The planner's problem is thus given by

$$\max_{C_t \; t\,0 \quad t\,1} E \quad {}^{t}U\;C_t \qquad \#$$

where $U\;C_t \quad \left\{\begin{array}{ll} \frac{C_t^{\;1}}{1} & \text{if} \quad 1 \\ \ln\;C_t & \text{if} \quad 1 \end{array}\right\}$.

One way to understand the difference between (2.7) and (2.9) is that the sum in the former runs from 0 to the random (with utility $U_{\min}$ thereafter) while the latter runs with certainty to . Equation (2.8) seems to suggest that the possibility of political catastrophe, and hence the termination of the dictator's reign, acts simply to intensify time discounting. Although there is some truth in this it misses the most crucial point about the model; the dictator's survival probability is *endogenously* determined. Thus, our formulation allows the dictator, in effect, control over discounting: a factor that is the key to our analysis.

Dynamic Programming Formulation

Let $V^d\;K$ denote the value to the dictator of a domestic capital stock of K. The Bellman equation for the dictator's problem is

$$V^d\;K \quad \max_{0\;C\;wK} \; U\;C \qquad 1 \quad q\;K \;\; V^d\;1 \qquad K \quad I \qquad q\;K\;V_{\min} \qquad \#$$

Equation (2.10) just says that the value V^d to a dictator of a given level of domestic capital, having avoided catastrophe this period, is the utility of consumption plus the value of the resultant domestic capital next period discounted by and the probability of avoiding catastrophe plus the value of losing power times its probability also discounted by . It is well known that this formulation is equivalent to (2.7).

Similarly, let $V^p\;K$ denote the value to the planner of a domestic capital stock of K. The Bellman equation for the social planner is

$$V^p\;K \quad \max_{0\;C\;wK} U\;C \qquad V^p\;1 \qquad K \quad I\;. \qquad \#$$

Capital and Political Stability

Consider our working hypothesis that more domestic capital causes greater stability. Might it not be more sensible to posit that public pressure punishes a dictator for deviating too far from the behavior of a social planner rather than for not building a large enough capital stock? It might be sensible for a homogenous public to establish a survival probability for a dictator that decreases in the distance of economic policy from optimality. However, consider the following micro underpinning for our hypothesis. At the beginning there are two groups, an elite group (the dictator's people) and a non-elite group (people who would like to overthrow the dictator). Imagine the probability of overthrow is an increasing function of the size of the non-elite group. Now suppose the elite co-opts, e.g., by transferring some wealth, some members of the non-elite into joining a third group that is politically neutralized, i.e., that does not actively oppose the dictator. It is intuitively plausible that the wealthier is the elite the larger will be the fraction of the non-elite the former is able to co-opt. That is, a larger capital stock at the disposal of the elite will allow it to buy more political stability. footnote

The correspondence between a given country's political stability and its present capital stock is a key premise of our paper so we consider here some pertinent empirical evidence. Londregan and Poole (1990) did extensive empirical work on coups. One of their main conclusions is that the probability of coups is indeed decreasing in income. As noted in section 2.5 coups and political catastrophes are not synonymous.. Nevertheless, there is surely sufficient overlap to make Londregan and Poole's result relevant, especially considering that they obtained a very strong result. Londregan and Poole also show that economic growth reduces the probability of coups. Przeworski et. al. (1996) and Przeworski and Limongi (1997) reinforce the point by showing that growing dictatorships are much less likely to democratize than shrinking ones, i.e., on average growth tends to be stabilizing for dictatorships in a different dimension. Again, political catastrophe and democracy are not identical but overlap significantly.

Results

The Basic Approach

The problem is too complicated to yield an analytical solution so we solve it numerically. footnote Table one gives the parameter values included in the computations. Our goal was to be as realistic as possible. For standard parameters we used typical values from the growth literature. In fact, everything is entirely standard except for the parameters of the catastrophe function, which does not have any close counterpart in any established literature we know of. For this reason we ranged over a large number of parameters for the catastrophe function. There are a total of 432 parameter sets. We give details of the computational procedure in the appendix. Table 1 gives the computational grid.

[TABLE 1 ABOUT HERE]

Dependence on Initial Domestic Capital – Bifurcation

In 429 out of the 432 cases there is a bifurcation point for domestic capital in the solution to the dictator's problem. That is, in these cases if initial domestic capital begins above some level K, then it will always increase, but if domestic capital begins below K it will always decrease. The remaining 3 cases involve growth even for very low values of K. As figure 1 shows, most of the bifurcation points are in the range between $1 billion and $10 billion. The values of K shown range from $.1 billion to $1 trillion, and the horizontal axis is logarithmic, with each interval indicating a multiple of ten in K. The plot is very slightly smoothed (otherwise it would consist of spikes) using kernel density methods, with 201 points and a kernel half-width of 0.025, ensuring that the fine structure of the distribution remains apparent. footnote

[FIGURE 1 ABOUT HERE]

The main reason for this behavior is captured by the following mechanism. If initial domestic capital is low the dictator has a low probability of retaining power for very long. Thus, it is pointless to invest and, therefore, he allows the capital stock to deteriorate while he plunders the economy. This is consistent with the idea that insecure dictators do not favor growth (Olson, 1991, 1993). On the other hand, if initial domestic capital is relatively high the dictator can look forward to a long reign in power and therefore will wish to invest, further delaying his expected departure date. In this case, the dictator's strategy is to restrain his plundering in exchange for increasing his time in power. Thus, moderate insecurity is consistent with economic growth. Clague et. al. (1996) show empirically that dictators who are in power for a long time are more restrained in their plundering, in the sense that they give more respect to property and contract rights, than those who are in power for a short period of time. This is consistent with our result if one posits that on average dictators who lasted a long time expected to last a long time and those who lost power quickly did not expect to hold power very long.

The following proposition further develops the bifurcation intuition.

Proposition Suppose the dictator's value function, $V^d\ K$ in equation 2.10, is strictly concave and differentiable. Then if the capital stock in period t 1 is (weakly) larger than the capital stock in period t, the capital stock in any period t will always be (weakly) larger than the capital stock in period 1. Conversely, if the capital stock in period t 1 is (weakly) smaller than the capital stock in period t, the capital stock in any period t will always be (weakly) smaller than the capital stock in period 1.

[Proof] Suppose $K_{t\ 1}\quad K_t$ but, contrary to the proposition, $K_{t\ 2}\quad K_{t\ 1}$. This would imply that $C_{t\ 1}\quad C_t$. Note that the solution to the maximization problem on the RHS of the Bellman equation (2.10) must be an interior solution. Consider the first order conditions for this solution at both time t and time t 1. They are

$$U\ \ C_t \qquad 1 \quad q\ K_t \quad \frac{dV^d\ \ K_{t\ 1}}{dK} \qquad 0 \qquad \#$$

and

$$U\ \ C_{t\ 1} \qquad 1 \quad q\ K_{t\ 1} \quad \frac{dV^d\ \ K_{t\ 2}}{dK} \qquad 0 \qquad \#$$

But $U\ \ C_t \qquad U\ \ C_{t\ 1}$, $1 \quad q\ K_t \qquad 1 \quad q\ K_{t\ 1}$ and $\frac{dV^d\ K_{t\ 1}}{dK} \qquad \frac{dV^d\ K_{t\ 2}}{dK}$ which leads to a contradiction. Therefore if the capital stock ever increases it can never again decrease.

The proof of the claim that once capital shrinks it continues to shrink is a mirror image of the above argument. [End Proof]

The computations indicate that the dictator's value function is strictly concave only for 50 of the 432 parameter sets tested so the proposition is of limited applicability. On the other hand, the computed value functions are nearly always concave at sufficiently low and high values of K (all but about 25 are strictly concave near K \$.1 billion and all are strictly concave near K \$1 trillion) so the proposition does provide insight for all of the cases. footnote

The Dictator's Policy Function

It is interesting to note the non-monotonicity of the consumption fraction as a function of domestic capital (hence income). In most of the cases the consumption fraction starts high, then falls, and then rises again. In the rest it decreases even at low K and then rises. The reason for this behavior is closely connected with the above discussion of bifurcation. If domestic capital is below the bifurcation point, then the optimal choice is to allow it to deteriorate. This implies that an increase in domestic capital that does not push the economy above the bifurcation point simply leads to higher current consumption. When the bifurcation point is crossed, however, the basic plan shifts from plundering the economy and extinguishing domestic capital to building it up. There is then an interval of higher domestic capital levels over which improved conditions for investing in domestic capital induce the policymaker to cut the consumption rate. The bifurcation point for an economy generally occurs near the beginning of this interval of declining consumption. At even higher levels of domestic capital, the consumption fraction once again begins to increase. This is consistent with the experience of Asian tigers who increased their saving rates at early stages of industrialization (World Bank 1993. pp. 40-42).

The Dictator Versus the Social Planner

The crucial difference between the planner and the dictator is that the planner does not exhibit bifurcation. In fact, for all the parameter values we used the social planner chooses positive growth for any initial domestic capital stock. So whenever our model dictatorships shrink it is always socially sub-optimal to do so.

Next, when the dictatorial economy has an initial domestic capital level sufficiently above its bifurcation point, it achieves a higher growth rate than the comparable socially-planned economy, i.e., it grows faster than is socially optimal. The intuition behind this result is that the dictator, but not the social planner, cares about the probability of survival. This endogenous probability is increased by heavy investment in domestic capital (equation 2.5). Thus, the dictator has a unique incentive to push for a high growth rate.

It is, perhaps, surprising that there are any circumstances at all under which the dictator outgrows the social planner. The dictator, in effect, discounts the future more than the planner because the former's planning horizon is truncated (stochastically) by the possibility that he will be removed from power. How is it that the one who discounts the future most strongly invests the most? The dictator can affect his survival prospects through his investment strategy: more investment leads to a longer expected term in office. Thus, the endogeneity of the political catastrophe is the reason for high investment. footnote

These considerations can be clearly displayed in the following manner. First, using 2.11, a solution to the dictator's problem starting from an initial capital stock K, C_t^d $_{t\ 1}$ must have the property that C_1^d solves

$$\max_{0\ C\ wK} \ {}_{U}\ C \quad 1 \quad q\ K$$
$$U\ C_2^d \qquad 1 \quad q\ K_2\ C \quad V^d\ K_3\ C \qquad q\ K_2\ C \quad U_{\min}$$
$$_{q}\ K\ {}_{U\min} \qquad \#$$

where $K_2\ C \quad 1 \quad K \quad wK \quad C$ and $K_3\ C \quad 1 \quad 1 \quad K \quad wK \quad C \quad w\ 1 \quad K \quad wK \quad C \quad C_2^d$. This problem can be interpreted as choosing consumption in period 1 subject to the constraints that the decision-maker will consume C_2^d, the quantity the (optimizing) dictator would consume in period 2, and then receive the continuation utility associated with the capital stock implied by his choice in period 1 and C_2^d. A solution to the planner's problem starting from an initial capital stock K, $C_t^p \;\; _{t \; 1}$, must have the property that C_1^p solves

$$\max_{0 \;\; C \;\; wK} U \; C \qquad U \; C_2^p \qquad V^P \; K_3 \; C \qquad \#$$

This problem can be interpreted as choosing consumption in period 1 subject to the constraints that the decision-maker will consume C_2^p, i.e., the quantity the (optimizing) social planner would consume, in period 2 and then receive the continuation utility associated with the capital stock implied by his choice in period 1 and C_2^p. These problems yield, for the dictator and social planner respectively, the first order conditions

$$0 \quad U \;\; C \qquad ^2 \, 1 \quad q \; K \quad q \;\; K_2 \; C \quad V^d \; K_3 \; C \qquad U_{\min} \qquad \#$$
$$^2 \, 1 \quad q \; K \quad 1 \quad q \; K_2 \; C \qquad \frac{V^d \; K_3 \; C}{K_3} K_3 \; C$$

and

$$0 \quad U \;\; C \qquad ^2 \frac{V^P \; K_3 \; C}{K_3} K_3 \; C \qquad \#$$

It is clear, from comparing the third term in 3.5 with the second term in 3.6, that for the dictator the marginal value of more capital next period is discounted by the extra $1 \quad q \; K \quad 1 \quad q \; K_2 \; C$ relative to the planner. This "horizon-shortening effect" argues for less investment. On the other hand, the dictator's term $^2 \, 1 \quad q \; K \quad q \;\; K_2 \; C \quad V \, K_3 \; C \qquad U_{\min} \qquad 0$ in 3.5 reflects an "endogenous-survival effect" that argues for more investment. It turns out that the latter effect dominates the former far enough above bifurcation.

The present result can be further understood by comparing typical dictators' and planners' policy functions as shown in figure 2. The figure compares the two optimal functions using identical parameter values. Above bifurcation consumption in the dictatorial economy falls to a level below that in the planner's economy, leading to faster growth. For high levels of domestic capital, policies of the dictator and social planner converge because instability is extremely low (equations 2.10 and 2.11 demonstrate this mathematically). Indeed, when the threat of political overthrow is tiny, the dictator and social planner become indistinguishable.

[FIGURE 2 ABOUT HERE]

Figure 3 gives a picture of the distribution of capital stocks at which the dictator's consumption dips below that of the social planner ranging over all the parameter values we studied. Note that the capital stocks required for the dictator to outgrow the planner are not especially high; all of these "cut-through points" are below \$100 billion and 74% of them are below \$10 billion. We also studied the response of cut-through points to changes in underlying parameters and got exactly the same qualitative results as we had for the response of bifurcation points to parameter changes.

[FIGURE 3 ABOUT HERE]

The magnitude of cut-through is quite significant. An average of 1.4 orders of magnitude (686.8 grid points) within the range K \$.1 billion to \$1 trillion involved the dictator's consumption strictly less than the social planner's. The various parameter sets ranged from 0.69 to 2.88 orders of magnitude (343 to 1441 grid points) in which the dictator's consumption was lower over that range. Among the values of K for which the dictator's C was lower, the dictator on average chose 26.1% less consumption than the social planner (with the mean percentage below ranging from 2.8% to 52.3% for alternative parameter sets). Again, among the values of K for which the dictator's C was lower, the dictator on average had a growth rate higher by 0.0044 (0.44% per annum) than the social planner (with the amount higher ranging from 0.000017 to 0.0174 for alternative parameter sets). The differences in growth rates were much more pronounced than these averages at values of K shortly after the cut-through.

Comparative Statics, Interpretation and Policy

Comparative Statics

The computations yield the following unambiguous results on how the bifurcation point, when it exists, responds to changes in underlying parameters. The bifurcation point is decreasing in , and . The first is the unsurprising result that patient dictators are more development-oriented than impatient ones. An interpretation of the second result is that the more lucrative it is to run the country the more interested the dictator will be in growth because growth stabilizes his position and creates a larger pie to steal from. The third indicates that rapidly depreciating capital sufficiently threatens political stability to produce a strong growth inclination. The bifurcation point is increasing in $U_{\min}$, i.e., dictators expecting a soft landing after losing power are less interested in growth than those who expect to suffer more when out of power. This is because growth is stabilizing so the more determined is a dictator to hold power the more inclined he is to foster growth. footnote The bifurcation point is increasing in political instability (as measured by $q_1 \left(\$10 \text{ billion}\right)$, see table 1) is bad for growth. The bifurcation point does not respond systematically to changes in or to changes in and that hold q_1 fixed.

The effect of changing q_1 may be of special interest if we consider that different countries may have different q_1's due to exogenous factors. For example, one might argue that Taiwan and South Korea in the 1950s were able to achieve higher political stability at a similar level of development than was the Philippines, due to higher equality resulting from land reform. The differences in q_1's might have put these countries on different sides of their respective bifurcation points, at least for some time periods, resulting in the large differences in per capita GDPs they have achieved today.

It is important to note that the model does not simply predict that poor countries always decline and rich countries always grow. Of course, for any fixed set of parameters there is bifurcation, but the location of the critical point depends on all the parameters. So, for example, Argentina may be richer than Taiwan at a particular point in time but Taiwan might grow and Argentina might shrink if Taiwan can find a source of intrinsic political stability that Argentina cannot.

Another grand comparative static is to compare the variation in growth rates across regime types. The result is that our model dictatorships display much more variability in growth rates than do the model social planner economies. In particular, the standard deviation of growth rates, ranging over all parameter values and a sampling of 2001 logarithmically equally spaced initial *Ks*, (ranging from \$.1 billion to \$1 trillion) is 13.1 for the dictator and 7.4 for the social planner. The high variability for the dictator is due to strong policy response to varying *K* rather than to response to changing parameter values. This result ties in with the empirical results of Almeida and Ferreira (2002) who show that the variability of economic performance in dictatorships is higher than that in democracies. Of course, our results are not directly comparable with theirs because we compare dictatorships to social planner economies and they compare dictatorships with democracies. However, if one accepts the notion that democratic pressure prevents governments departing extremely far for optimality then democracies will behave somewhat like social planner economies and there is a basis for comparison between our paper and Almeida and Ferreira's.

Interpretation

With our results in hand we now briefly consider a number of development cases. We organize this discussion around a comparison with Robinson (1997), the other serious attempt to address the determinants of whether a state is predatory or developmental. We think the discussion makes clear that both models have significant relative strengths.

We first compare and contrast the two theories. They agree that low initial income and high intrinsic instability are risk factors for predation. The theories diverge on the effects of time horizons and on the consequences of the degree to which the elite skims off resources. footnote In Robinson (1997) a more patient and/or more encompassing elite is less likely to be developmental than its less patient and/or less encompassing cousins. We have the opposite result on both counts. Our prediction of suboptimally fast growth in developmental dictatorships differs from Robinson (1997) where developmental states always behave optimally. Finally, Robinson (1997) alone has a role for natural resource wealth as a risk factor for predation. In the following discussion we focus on time horizons and the degree to which dictators are encompassing. Note, however, that below we will never consider intrinsic patience as a preference. Rather we consider time horizon only as it relates to survival prospects.

The Robinson (1997) story seems quite persuasive for the famous plundering dictators such as Trujillo in the Dominican Republic, the Somoza's in Nicaragua, the Duvalier's in Haiti and Mobutu in Zaire. footnote Long-lived plundering dictators are problematic for our theory because in our framework dictator-predators should begin with a relatively high probability of losing power and this probably should steadily increase the more they plunder. Therefore, long-lived predators must be lucky to retain power as long as they do. Of course, low probability events do occur and it may be that some of the above dictators always assumed that they might lose power at any moment. Nevertheless, it is reasonable to posit that most long-lasting dictatorships had good chances ex ante of lasting for a long time.

On the other hand, many countries experience long sequences of plundering dictators, frequent coups and economic deterioration, a pattern that fits our theory well. An excellent example is Uganda after independence that had seven changes of government between 1979 and 1986 alone and many further changes outside this period (Rake 2003). Ghana 1960-90 and Argentina 1946-1982 also fit the profile of decline, corruption and coups (McCaskie 2003, Skidmore and Smith 1997, ch. 3). Within the Robinson (1997) framework one would have to argue that the dictators in these countries had reasonable survival prospects which they further enhanced by letting their countries' infrastructure decline. However, the reality of frequent power changes suggests that these rulers would have perceived themselves to have low survival chances. Moreover, if infrastructure deterioration did contribute to political stability the effect was probably small given the large number of coups we observe ex post. In contrast, our framework of economic deterioration linked with low and declining survival prospects for dictators seems a natural way of viewing these cases.

Also, congenial to our framework are rapid-growing-long-lived dictatorships. Prime examples are the Asian miracle economies, particularly Suharto's Indonesia (Temple 2003) and Mahathir's Malaysia (Gomez and Jomo 1999). footnote These are highly encompassing regimes with very long lives that effectively distributed the fruits of rapid growth to consolidate their political power. More generally, Campos and Root (1996, p. 3), building on World Bank (1993) write of the Asian miracle economies: "Broadly similar historical circumstances led each regime to pursue shared growth as a strategy for legitimating its rule." Our theory predicts not just rapid growth for developmental dictatorships but suboptimally fast growth. It is difficult to find direct evidence on this score but it is nevertheless worth mentioning the papers of Young (1995) and Lau and Kim (1994) arguing that Asian growth has been based primarily on the relentless accumulation of factors of production rather than on total factor productivity growth. In other words, the growth has been fast but costly, perhaps too costly. footnote Another important example of rapid growth at extremely high cost is the Soviet Union under Stalin where the industrialization speed was surely forced well beyond any conceivably optimal speed with the goal of reducing the threat that communism would be overthrown by the capitalist or fascist powers. footnote This case is another variation on the theme of growth bringing political stability.

Thailand since 1965 strikes us as a good example of a Robinson-type developmental dictatorship since it has combined frequent coups with rapid growth (Campos and Root 1996, pp. 7-10). The Thai dictatorships also do not appear to be nearly as encompassing as were the likes of Mobutu and Trujillo. Therefore, one might usefully think of these dictators as willing to undertake some politically destabilizing infrastructure development as part of a short-term attempt to expand the base from which they could profit. In our framework, in contrast, we would have to argue that Thai dictators continuously stabilized their political environment through investment but were plagued by bad luck, experiencing many improbable coups.

Policy

Choices made by dictatorships facing instability will often vary from choices predicted by standard growth models involving benevolent social planners. Good policy analysis should acknowledge the realities of dictatorships. Failure to do so may contribute to the mixed success of foreign aid programs. footnote

As one step toward explicit thinking about dictatorships, our paper provides a novel perspective on how dictatorships may respond to aid. In our framework decreasing resource skimming (lowering) actually yields lower growth, while decreasing a dictator's anticipated out-of-power utility, *Umin*, is good for growth. These results are due to the fact that the larger is the difference between a dictator's in-power and out-of-power utility, the greater is his determination to retain power and hence to encourage economic growth. This logic suggests that if the international community wishes to increase growth rates in dictatorships then it should focus effort on reducing the comfort of dictators who have lost power, for example by freezing bank accounts and by prosecuting human rights violations. Thus, General Pinochet's recent experience in London may be good for growth in the developing world while reducing the corruption of those who hold power might get the opposite result.

A second point revolves around our bifurcation result. Giving moderate aid packages to unstable dictatorships will not cause a take-off of growth. Rather, it will just delay the downward spiral of consumption and predation. This conclusion would be modified if a foreign donor could contribute in a special way so as to enhance political stability enough for the economy to reach the other side of the bifurcation. Of course, all this policy analysis would be reversed if the international community prefers not to help dictatorships to grow.

Conclusion

We believe that our assumption about the relationship between the capital stock and political stability has good empirical grounding and has led us to many interesting results. Yet, it cannot be considered an iron law of nature. In certain situations rapid growth may be destabilizing (Olson 1963). Indeed, as we have seen Robinson (1997) produces many valuable insights working essentially off the opposite premise. We believe it may be possible to reconcile the two approaches by distinguishing carefully between different types of investments in an environments where an elite group tends naturally to support the dictator while a non-elite group tends to oppose him. Investment that strengthens the elite is stabilizing while investment that strengthens the non-elite is destabilizing. Thus, stabilizing investments could include construction contracts for big office buildings or the development of a port to aid the shipping industry. Such business can feed politically connected constituencies while creating infrastructure with minimum potential to enhance the organizing opportunities of the non-elite. Also, if a particular investment enhances the government tax base or creates wealth that the government can simply expropriate, then the government should be able to strategically reallocate the proceeds so as to strengthen its position. On the other hand, some investments such as basic health and education investment probably will strengthen the non-elite relative to the elite and be destabilizing for the government. Some big infrastructure projects such as roadbuilding and telecommunications, although wealth-enhancing for the elite, may still on balance be dangerous to the dictator because of the opportunities for anti-government organization they offer.

Of course, if one acknowledges that there are both stabilizing and destabilizing investments then a key issue for a dictator would be whether he can find lots of stabilizing ones while largely avoiding the destabilizing ones. We suggest, however, that depending on specific circumstances this may or may not be possible. Thus, some dictators might perceive no way forward without destabilizing themselves while others might see their salvation in economic growth. For example, maybe Zaire could not have properly developed its numerous minerals industries without a substantial supporting investment in roadbuilding, yielding potential rebels a vital tool for challenging the government. On the other hand, perhaps Singapore had the opportunity to grow by developing its ports without risking much destabilization.. These examples are merely meant to be suggestive but they do seem to point the way to a rich theory of dictatorship and development. A full integration of our approach with Robinson (1977) remains a serious task for future research.

Appendix: Solution of Optimal Policy Functions

Optimal policy functions for the dictator and social planner were computed for a broad range of plausible parameter values. A value of capital of $10 billion was chosen (without loss of generality) as the approximate value of a typical country's initial capital. A range from $0.1 billion to $1 trillion was then chosen as the set of values of capital for which results would be examined. Possible parameter values were chosen to yield values of production and other variables that match approximately with available empirical information, particularly around K $10 billion. Table 1 shows the values considered. Every possible combination of these parameters was tried, yielding 432 sets of parameters.

For each set of parameter values, the dynamic programming problem was solved using a grid of possible values of capital. The grid was constrained to a finite set, which guarantees convergence for at least the social planner's optimal value function using Denardo's contraction mapping theorem. To ensure that the finite constraints of the grid had little impact on the results, the constraints were chosen to be two orders of magnitude below and above the range of results to be examined. The grid used thus ranged from $0.001 billion to $100 trillion, with 4,001 grid points equally spaced in the logarithm of K (thus yielding 500 grid steps per order of magnitude in K).

The usual method to converge on an infinite-time-horizon optimal policy is to start by assuming that for any value of K, society consumes all production in a hypothetical future period. The computation process then works backward in time, at each step computing for each value of K the optimal consumption given the discounted future value computed so far for next period's K (which is uniquely determined by current K and consumption). The computation is declared to have converged on an infinite-time-horizon optimal policy when the change in the contemporaneous value function, between the current and previous time step, is less than . We used 1.0 10^{5}, with the steps equal to 1 year, and required that the convergence criterion be met for all points in the K-grid before convergence would be declared. footnote

For all cases the policy functions as well as the value functions converged. To ensure adequate convergence, an additional convergence criterion was required to hold before convergence was declared. For each point in the K-grid, the optimal fraction of output consumed had to differ by less than from the value computed at the previous step, and this requirement had to hold for an additional 50 consecutive steps. The extra steps were required in case a small change in the value function at one step should induce a large change in the optimal policy function computed at a next step for some point on the K-grid; this sensitivity in computation was observed for some parameter values and the 50 additional steps appeared to be more than adequate to handle the sensitivity.

After solving for the optimal policy for a given set of parameters, it was necessary to carry out further tests. To isolate bifurcation points in economic growth for the dictator, we started with low and high values of K of $0.1 billion and $1 trillion respectively. The algorithm used initial working assumptions of negative growth at the bottom of this range and positive growth at the top of the range, and iterated by testing at the midpoint of the range to see whether growth was negative or positive. The search continued at each iteration by testing the midpoint between the highest point so far found to have negative growth and the lowest point so far found to have positive growth. The search was stopped when the difference between the values of K considered was less than 0.005. If the search stopped within 0.005 of the minimum or maximum of the range tried, positive or negative growth respectively was declared to have occurred throughout the range. In any case a more intensive search was carried out above and below the apparent bifurcation point (or above the minimum or below the maximum if positive or negative growth was declared) to ensure that the growth patterns indeed involve a bifurcation with decline for values of K below the apparent bifurcation point and growth for values of K above the apparent bifurcation point (or growth or decline only if no bifurcation point was found). The search above (below) the point found was carried out by first testing the value of K equal to 1.001 (0.999) times the value of K at the point, then successively increasing the distance away from the point by 10% per iteration until the full range from $0.1 billion to $1 trillion had been scrutinized.

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Table 1. Parameter Grid for Computations

Parameter	Used for	Units	Values
a	Production	none	0.3333
q	Catastrophe	1/(billion $)	ln(.75), ln(.9), ln(.97)*
h	Catastrophe	none	$\ln q_1 - 10q$, with q_1 = .05, .15, .3, .5**
d	Depreciation	1/years	.05, .1
s	Utility function	none	0.5, 1, 1.5
l	Appropriation	none	normalized to 1 (but variations of $U_{\min}$ are analogous)
$U_{\min}$	Utility function	utiles	$= U(a_1 a_2 F(K_0 = 10))$, where a_1 is a typical consumption fraction and a_2 is a multiplier to the dictator's consumption when out of power relative to when in power; $a_1 a_2$ = .001, .01, .05
b	Discount factor	1/years	.90, .95
r	Mobile capital	1/years	.02
n	Production	billion $/year	$\left[\frac{3(G+d)}{ag}\right]^{a}\left[\frac{r}{1-a}\right]^{1-a}$, where G is a typical national capital growth rate when 1/3 of output is invested, G =.03

*The values for θ imply that if K increases from its initial value of 10 to a value of 11 billion dollars one year later, the catastrophe probability falls by a multiple of .75 / .9 / .97, i.e. by 25% / 10% / 3%, over that one-year period.

**The values of η are computed after finding the value for θ, and are chosen such that q_1, the probability of catastrophe at the end of the dictator's first year in power, is .05, .15, .3, or .5. Note that $F(K_0=10)$ in the expression above can be replaced with $ua\left(\frac{u(1-a)}{r}\right)^{\frac{1-a}{a}} 10$.

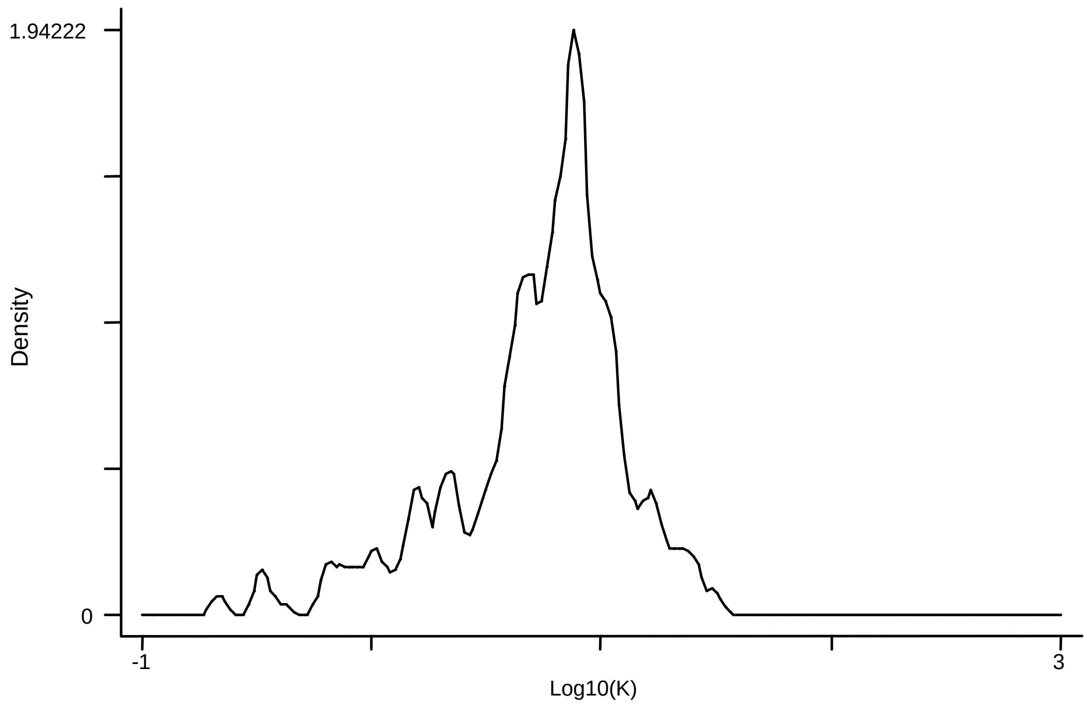

Figure 1. Values of K at Which Bifurcation Occurs

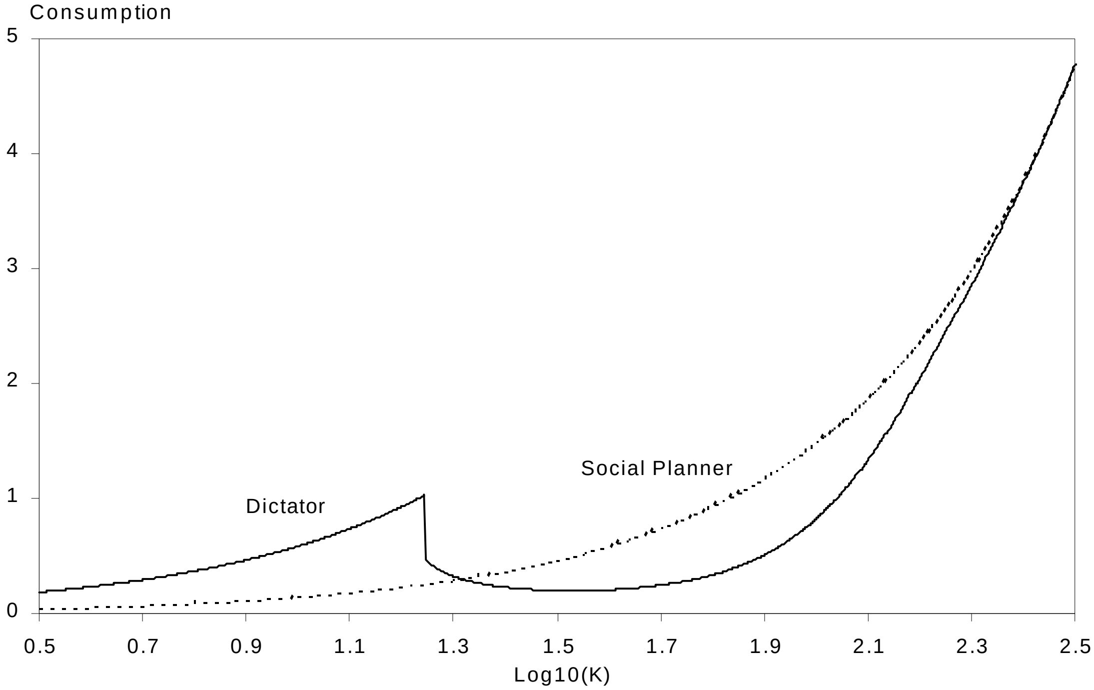

Figure 2. Typical Dictator's and Planner's Policy Functions ($billion of consumption and capital)

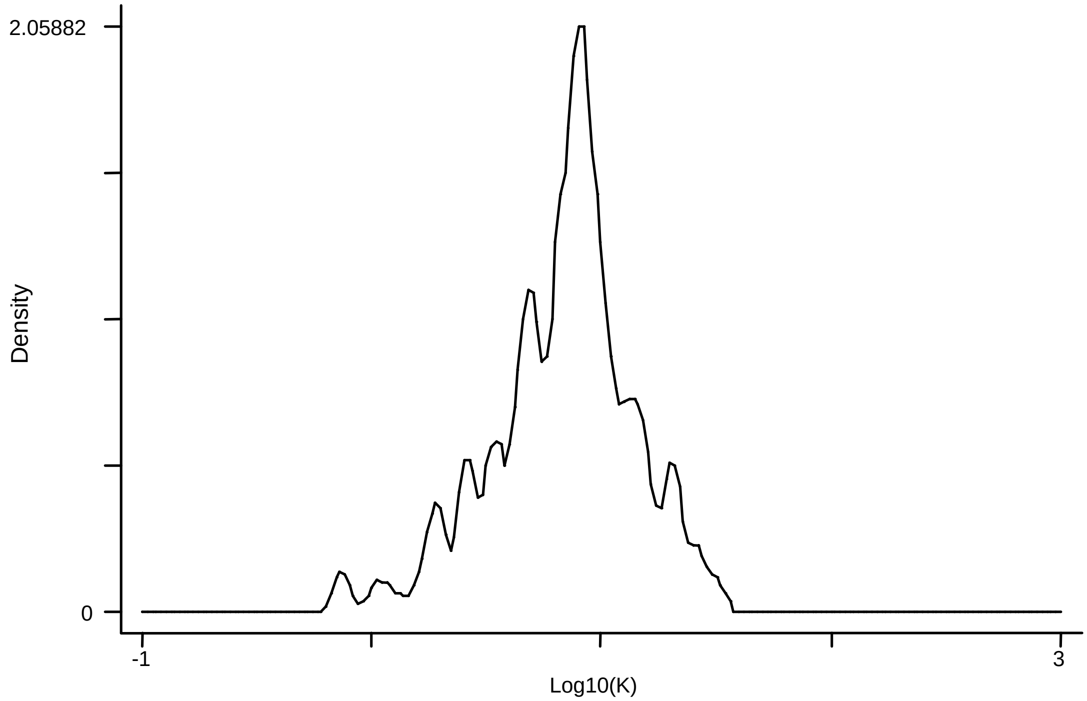

Figure 3. Values of K at Which Cut-Through Occurs