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"Political Regimes, Instability and Economic Growth"

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Abstract

In this paper we develop a formal model of how sociopolitical instability affects long run economic growth. The degree of instability is represented by the shortening of the executive's permanence in office. The analysis is carried out in the framework of three political systems: full democracy, majority rule and dictatorship. The agents are assumed homogeneous -except for their rates of time preference- and each system chooses a different representative agent.

A shorter temporal horizon forces the executive to reevaluate the optimal consumption program, by increasing the rate of time preference and the consumption at the beginning of the plan. This leads to lower capital accumulation and steady state growth. Besides, the effect of the political regime on the growth process depends both on the degree of sociopolitical instability inherent to each regime as well as on the shapes of the income and preferences distributions. In the more common case of a positively (negatively) skewed distribution of income (preferences), in absence of instability, the dictator is more patient than a fully democratic government, which in turn is more patient than a majority rule government. This implies that "the political participation-growth relation" adopts an U shape. However, when instability is introduced, more patient executives are forced to carry out a higher adjustment of their growth paths. Thus, with instability, in the more common case of a positively skewed income distribution, such relation can exhibit a flat or even an inverted U shape. These results seem compatible with previous empirical findings; in particular, they could explain the inverted U shape of the politics-growth relation found by Barro (1997).

Key words: growth, sociopolitical instability, political regimes. JEL subject classification: O40, P16.

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1 Introduction

There exists an important body of recent empirical literature supporting a negative relation between sociopolitical instability (SPI) and economic growth.[1] Venieris and Gupta (1986), by using a proxy of sociopolitical instability, which resumes several indicators of political unrest and social violence, find that SPI reduces investment. Knack and Keefer (1995) provide data that implies the maintenance of the rule of law is favorable to growth. Similarly, Helliwell (1994) finds that measures of political rights and civil liberties are positively associated with gross domestic product. In turn, Barro (1991), in a cross-sectional analysis, shows that two political variables, the frequency of coups d'etat and the number of political assassinations, affect negatively economic growth.

On the other hand, SPI is approximated by means of the average length of executive turnover. Edwards and Tabellini (1991) argue that unstable executives suffer of myopia in fiscal policy decisions, leading to a more heavy borrowing, which harms long run growth. Alesina et al. (1996) approximate SPI using three separate variables: every government change, major changes in government and coups d'etat; they also find that growth is decreasing in executive instability. In a cross-section analysis they show that the average per capita growth is lowest in years with coups d'etat, a bit higher in years with government change, and highest in periods without changes. Hopenhayn and Muniagurria (1996) also prove that policy variability (a higher frequency of regime switching) implies a lower economic growth. In turn, the theoretical approach of Devereux and Wen (1996) shows that political instability provokes lower private investment. This instability induces governments to leave smaller assets to their successors, which leads to higher future tax capital, and so to lower investment. More recently, Riedl (1999) argues that if property rights are not perfectly secure poor countries fall in an instability and inefficiency trap. Hence, the divergence between the growth rates of poor and rich countries is also due to instability.

In short, the previous empirical research shows a clear SPI-growth relation: economic growth is negatively affected by political instability, but not significantly by the type of political system. Nevertheless, more recently Barro (1997) finds that the degree of democracy of a country influences its growth rate in a *inverted U* shape: the growth rate is higher for the middle levels of democracy and lower for the less and the more democratic countries . A possible explanation for this relation is that dictatorships obstruct the normal functioning of market forces, while more freedom promotes entrepreneurship and investment. In turn, a full democracy, where all political positions influence policy making, seems to promote a higher degree of distribution and therefore lowers the accumulation of capital and the rate of growth.

These findings require more theoretical support. They must be backed up by a conceptual framework, postulating specific *channels* connecting SPI and economic performance. In this paper we develop a formal model of how SPI,

[1] For a survey on this topic see Alesina and Perotti (1994).

represented by the shortening of the length of the executive's term in office, lowers capital accumulation and growth. We consider three different political systems: full democracy, majority rule and dictatorship. The preferences of the executive will differ from a regime to another while the response to instability will be conditioned by the degree of political participation and the distribution of income and preferences among the agents. It seems reasonable to assume that each political regime has an inherent degree of SPI associated to it. We postulate that instability is higher for dictatorships, lower for full democracy and still lower for majority rule regimes. Then, the representative (i.e. the executive) should increase consumption in response to the possible shortening of time in office. This response will be different for each regime, but for all of them a higher early consumption will lead to a lower steady state growth.

In section 2 we formulate the Ramsey model of optimal economic growth, considering that agents are homogeneous, except in their rate of time preference and their income level. We postulate that the ordering of agents in terms of their initial income levels remains the same for all future times (even if income increases or decreases for all of them). Besides, an inverse relation between the relative income and time preferences distributions is assumed. That is the poorer the agent the higher the rate of impatience. The model implies that the steady state depends negatively on the rate of time preference: when it is higher the current consumption is higher and then capital accumulation is lower. Section 3 introduces the political systems: full democracy, majority rule and dictatorship. Political participation goes in increasing order from dictatorship to full democracy, being the majority rule an intermediate case. Each regime chooses a different representative agent (i.e. a different executive), defined as a particular element of the income distribution: the median as the representative of the majority rule, the mean element as the chosen executive of full democracy and either the maximal or minimal element in the case of dictatorship. In the more common case of an income (time preference) distribution with positive (negative) skewness,[2] the relation between political participation and the steady state adopts an U shape, which is contrary to the inverted U found by Barro (1997). But this is only an intermediate result since it arises in absence of SPI. In section 4 we introduce SPI, and show how an executive increases the consumption program when the prospect of staying forever in office fades away. This adjustment is higher for dictatorships than for full democracies, which in turn adjust more than majority rule regimes, because of the SPI associated to each political system. We assume that after leaving office the executive stops

[2] The idea is that the richest people constitutes a little percentage of the total. Thus, the income distribution has positive skewness. According to Lambert (1993) "The inequality in a typical income distribution is evident from an examination of the three measures of central tendency; mean, median and mode. These are typically configured as follows:

mode $<$ median $<$ mean.

Thus, evidence suggest that the most common income level is less than halfway up the distribution, and the income halfway up the distribution is itself below average. This points to the presence of positive (or right) skew in the distribution -a drawn-out upper tail of high incomes in the frequency density function."

belonging to the economy. [3] Hence, the perspective of a shorter time horizon causes an increase of time preference, and so of the consumption during the period of the executive in office. Patient executives adjust proportionally more than the more anxious, because the latter are closer to their desired consumption than the former. In turn, in the more common case of a positively skewed income distribution, the prospect of a shorter time in office changes the shape of the "political participation-growth" relation. This is in such a way that the U shape turns in a flatter curve or even in an inverted U, which do agree with Barro's findings. Finally, section 5 presents the conclusions.

2 The Economy

In this section we develop the economic model, which constitutes the basic framework to discuss how SPI affects economic growth. We assume that the economy is closed and produces a single homogeneous good which can be allocated to consumption and saving. The inputs are aggregated capital (K) and labor (L), and the production function exhibits positive and diminishing marginal productivity with respect to each input, constant returns to scale and verifies the Inada conditions. Thus:

$$y = f(k) \tag{1}$$

where y and k are the *per capita* income and capital, respectively. Savings are entirely invested, i.e. converted into physical capital, which does not depreciate, and labor (L) is assumed constant. Calling c and $\dot{k}$ to *per capita* consumption and investment, respectively:

$$f(k) = c + \dot{k} \tag{2}$$

On the other hand, agents live forever and are homogeneous, in the sense that they valuate instantaneous consumption in the same way. Hence, for each agent i:

$$u_i(c(t)) = u(c(t))$$

The utility function is increasing and concave, and intertemporal substitution elasticity $(-\frac{u'(c)}{cu''(c)})$ is constant. The difference among agents resides in their rates of time preference. Each agent i has an idiosyncratic rate of time preference, ρ_i. Therefore, the optimal consumption plan for i optimizes the sum of discounted instantaneous utilities

$$\int_0^\infty u(c(t))e^{-\rho_i t}dt$$

subject to

$$\dot{k} = f(k) - c \tag{2'}$$

[3] This assumption intents to capture the common results of SPI: assassination, exile, etc., of the former executive. In any case the overthrown leader is no longer a member of the economy.

$$k(0) = k_0 \quad (3)$$

$$\lim_{t\to\infty} k(t) \geq 0 \quad (4)$$

where (2′) indicates how capital evolves; (3) means that *per capita* capital has an initial value k_0 and (4) states that the amount of capital can never become negative.

This dynamic optimization problem, known as the *Ramsey problem*, has always solutions when the functional forms are the same as in our model. The solutions consist in temporal paths for k, c and y, each converging to a steady state value, k^*, c^* and y^*, respectively.

In this formulation, each agent has a preferred long-run plan for the entire economy. An agent i has to choose a feasible consumption path in such a way that the discounted sum of utilities is maximal. This implies that the agent's plan has to specify, for each instant, the levels of *per capita* consumption and investment.

Each rate of time preference corresponds to a different steady state growth. In effect, each consumption plan is complemented by a capital accumulation plan, which converges to a steady state value. According to the rate of time preference the equilibrium will be different:[4]

Proposition 1 *To each economically feasible ρ it corresponds a unique vector of steady state values $\langle k^*_\rho, c^*_\rho, y^*_\rho\rangle$ as solutions for the Ramsey problem. Moreover, for two values ρ_1, ρ_2, with $\rho_1 > \rho_2$, $\langle k^*_{\rho_1}, c^*_{\rho_1}, y^*_{\rho_1}\rangle <_{\Re^3} \langle k^*_{\rho_2}, c^*_{\rho_2}, y^*_{\rho_2}\rangle$ (where $<_{\Re^3}$ is the order relation in $\Re^3$).*

Proof of Proposition 1 *Trivial. Given a generic ρ, Ramsey's problem can be solved using Pontryagin's Maximum Principle. It involves the formulation of an Hamiltonian function (by introducing a costate variable λ):*

$$H(c, k, \lambda) = u(c(t))e^{-\rho t} + \lambda(f(k(t)) - c(t))$$

which has to verify two first-order conditions:

$$\frac{\partial H}{\partial c} = 0$$

$$\frac{\partial H}{\partial k} = -\dot{\lambda}$$

This means that:

$$e^{-\rho t}u'(c) = \lambda$$

$$f'(k) = -\frac{\dot{\lambda}}{\lambda} \quad .$$

[4]The results are the same when instead of converging to steady state *levels* we consider convergence to steady state *rates*. Even if it were more realistic to consider rates, it would involve to state a more complicated model of growth without adding further intuitions.

Taking logarithmic derivatives and combining both expressions we get:

$$-\rho + \frac{u''(c)}{u'(c)}\dot{c} \; = \; -f'(k)$$

Assuming a constant elasticity of substitution, $\sigma = -\frac{u'(c)}{cu''(c)}$, *we have that*

$$\frac{\dot{c}}{c} \; = \; \sigma \cdot (f'(k) - \rho)$$

which, in steady state, yields $f'(k) = \rho$. *Since* f *is a strictly concave function, there is a unique value* k^*_ρ *verifying this relation. This value is non-negative, verifying trivially the last constraint on the solution. On the other hand, in steady state* $\dot{k} = 0$. *Then, from* (2) *and* (3) *follows that* $c^*_\rho = y^*_\rho = f(k^*_\rho)$, *being all unique values.*

The second part of the proposition can be shown to be true considering two rates of time preference, ρ_1 *and* ρ_2, *such that* $\rho_1 > \rho_2$. *The differential equation that summarizes the solution to the optimal growth problem is*

$$\frac{\dot{c}}{c} \; = \; \sigma.(f'(k) - \rho)$$

and replacing by ρ_1 *and* ρ_2 *it follows that the steady state values verify that* $f'(k^*_{\rho_1}) > f'(k^*_{\rho_2})$. *Since* f *is a function that exhibits diminishing marginal products,* $k^*_{\rho_1} < k^*_{\rho_2}$. *Therefore, since* f *is concave,* $f(k^*_{\rho_1}) < f(k^*_{\rho_2})$ *and so,* $c^*_{\rho_1} < c^*_{\rho_2}$, $y^*_{\rho_1} < y^*_{\rho_1}$, *as claimed.* □

This trivial result generalizes the well known *golden rule*. Besides, this result implies that a higher feasible degree of impatience, which forces to a higher initial consumption, leads to a lower steady state growth.

On the other hand, there seems to exists an inverse relation between the distributions of time preference rates and of relative income. This is associated to a line of research that studies variations in time in the preference parameters, and particularly of the rate of time preference. Several authors assume that ρ_i is a function of the agent's level of income, $y_i(t)$ (e.g. Barro and Sala-i-Martin (1995), Mantel (1967), Uzawa (1968)). Our approach is akin to the literature that assumes the rate of time preference to be a decreasing function of income: a higher income implies a lower rate of time preference (see Blanchard and Fisher (1993) and Mantel (1997)). The intuition is that to sacrifice consumption in order to accumulate for the future involves a greater privation for lower levels of income (see Fischer (1930)). We work here with a *qualitative* version of this intuition: lower income agents are more impatient, so that they have a higher rate of time preference and are led to lower steady state values. The difference with previous approaches is that they treat the rate of time preference as a function of absolute levels of consumption, while we consider it only in terms of relative incomes. This means that the main element is the *ordering* induced by the income distribution. Then, even if the consumption levels of all agents increase, the poorest will still be more impatient while the richest will have the lowest time preferences.

We order the set of agents (the labor force), $\mathcal{L} = [0, L] \subset \Re^1$, in terms of their relative incomes at time $t = 0$, and assume that this order remains unchanged from then on. Therefore, we avoid temporal inconsistencies induced by redistributive effects. More precisely, for any moment t we define $i \prec_t j$ if and only if $y_i(t) < y_j(t)$. Then, the ordering remains unchanged if $i \prec_0 j$ implies that $i \prec_t j$ for $t > 0$. Then we have:

Proposition 2 $\prec_t$ *is a continuous* weak order.

Proof of Proposition 2 *We have to prove that $\prec_t$ is complete and transitive to show that it is a weak order:*

- completeness*: given two elements i and j, either $i \preceq_t j$ or $j \prec_t i$ since either $y_i(t) \leq y_j(t)$ or $y_j(t) < y_i(t)$ (since $<$ on $\Re^1$ is complete).*
- transitivity*: given $i \prec_t j$ and $j \prec_t k$ it follows that $y_i(t) < y_j(t)$ and $yj(t) < y_k(t)$. Therefore $y_i(t) < y_k(t)$, i.e. $i \prec_t k$.*

To prove that $\prec_t$ is continuous we have to show that $Up(i) = \{j : i \prec_t j\}$ is an open set. But this is equivalent to show that $Up(y_i(t)) = \{y_j(t) : y_i < y_j(t)\}$ is open. This is true since $Up(y_i(t))$ is a left-open interval in $\Re^1$.$\square$

Moreover, $\prec_t$ has an associated statistic, the proportion of agents according to their position in the ordering, $\pi(i) = \frac{\mu(\{j : y_j(t) = y_i(t)\})}{\mu(\mathcal{L})}$, where μ is the standard Lebesgue measure in $\Re^1$. We assume that what matters for the agents, in terms of their rates of time preference, is precisely their relative position according to $\prec_t$, i.e. the ordering corresponding to the relative income distribution. As we said, the reason for this is that if an agent consumes less than most of the others she or he will tend to be less patient, while if an agent is well-off, she or he will be willing to postpone current consumption to accumulate more.

Formally, we endow $\mathcal{L}$ with the ordering $\prec$ ($\prec \equiv \prec_t$ for all t) and the distribution probability π, which is time invariant.[5] $\langle \mathcal{L}, \prec, \pi \rangle$ will be called from now on the *relative income distribution*. Then we define a continuous bijection

$$\rho : \langle \mathcal{L}, \prec \rangle \rightarrow \langle \Re^+, < \rangle$$

such that for a pair of agents, i and j, $i \prec j$, $\rho(j) < \rho(i)$. This function assigns to each agent a non-negative real number (the rate of time preference) inverting the order induced by the time-invariant relative income distribution. Hence, the *ordering* of agents according to their time preferences induces a concomitant (inverse) ordering on steady states. This implies that the more common case of a positively skewed income distribution is associated with a negative skewed rate of time preferences distribution, and viceversa. We have then the following result that follows immediately from Proposition 1:

[5]**Proof** If $y_j(0) = y_i(0)$ then both $i \preceq j$ and $j \preceq i$, i.e. $i \sim j$, where $\sim$ is the derived equivalence relation for $\prec$. Since $\prec$ does not change in time, the equivalence classes remain constant and therefore their measures are time invariant. That is, for every i, $\mu(\{j : j \sim i\})$ remains constant through time. $\square$

Corollary 1 *Each agent i has a steady state per capita income y_i^*. Moreover, if $i \prec j$ then $y_i^* < y_j^*$.*

This result establishes a direct connection between the distribution of income and preferences with steady states through the rate of time preference. However, at this stage there exists a multiplicity of alternative steady states, and the rules of this stylized economy do not indicate which one to choose. This problem can be addressed by introducing into the framework an additional element: the institutional structure. This means to enlarge the picture by considering the political system.

3 Political Regimes and Growth

In this section we introduce political systems into the economy. In our framework it means that formal methods will be added to select an agent as the "representative" of the society. This agent becomes the executive, whose preferences guide the official policy. The economy will grow until it reaches steady state path.

At this stage we assume that there is no political instability. This means that the executive will be selected at time $t = 0$ and the plan will be implemented from then on. Decisions are made once and for all, so that there is no place for change of policies or of representative agent.

Three political systems will be considered: majority rule democracy, dictatorship and full democracy. These systems are defined by how they choose representatives. In abstract terms, each system chooses a particular element of the distribution of time preferences. We call this representative agent a. Once chosen, this agent implements an economic policy such that the representative's time preference becomes the *aggregate* rate for the entire economy. This means that some agents will exhibit a faster growth rate than the aggregate, while others will show a slower rate. That is, the representative is able to induce a kind of "average" behavior, but not to imposse its preferences over all the population.[6]

The first regime we will consider is that of the simple majority rule. This is a fairly democratic state of affairs where pairwise voting among all the alternatives that are optimal for some agent yields an overall winner. Formally, as it is well known in the literature of social choice theory, the winner in such a system is the median voter (see Beck (1978)).[7] In our case we just consider the median agent according to $\prec$ and π. In other words $a_{maj} = median(\langle \mathcal{L}, \prec, \pi \rangle)$.

The second kind of regime is dictatorship, which is usually conceived as the type of government where the preferences of a single individual becomes the rule for the entire society. Our modeling primitive is that the dictator is the agent

[6] The details of how such a policy can be implemented will be ignored in this paper. We just add the condition, previously introduced, of not allowing the redistribution of income among the agents.

[7] Beck was the first author that introduced politics into optimal growth. His attack to the problem inspired several features of our model.

most opposed to the majority, i.e. a member of an extreme minority. Therefore, the rate of preference selected by a dictatorship will be on the extreme position of the distribution, opposed (with respect to the mean) to the majority rule representative.[8]

Finally, the third case corresponds to full democracy, which implies the participation of all the agents in policy making. Thus, in our case it means to average out the "votes" cast by the entire set of agents at $t = 0$. We represent here the balance of forces proper of proportional electoral systems, where the final decision is reached by a consensus of all the intervening parties. In one-dimensional elections, as the one implied here, it reduces to the selection of the weighted average of the "candidates".[9] Since this case is prone to time inconsistencies we have to look for a time invariant notion of "average". Our approach requires several steps. In the first step let us note that $\{\rho_i : i \in \mathcal{L}\}$ can be embedded in a bounded interval $\Psi = [\rho_{min}, \rho^{max}]$, the interval of feasible time preference rates. Then, we have to note that there exists a natural isomorphism ϕ between $\mathcal{L}/\sim$ (the set of equivalence classes of $\langle \mathcal{L}, \prec \rangle$) and Ψ: for each equivalence class $\bar{i}$ there is one and only one $\rho \in \Psi$ such that $\rho = \rho_i$ for each $i \in \bar{i}$. Since $\prec$ is a continuous weak order, $\mathcal{L}/\sim$ is isomorphic to a closed interval of $\mathcal{L}$. Therefore $\phi(\bar{i}) = \rho$ establishes an order-preserving continuous transformation. In particular, π remains invariant under ϕ. Then, abusing slightly of language, we can define the average for $\langle \mathcal{L}, \prec, \pi \rangle$ as $a_{demo} = \int_{\mathcal{L}/\sim} \pi(\phi^{-1}(\rho))\phi^{-1}(\rho)d\phi^{-1}(\rho)$.

The definition of a_{demo} and a_{maj} allow us now to characterize dictatorship in formal terms: if $a_{maj} \prec a_{demo}$ then $a_{dict} \in$ maximal$(\langle \mathcal{L}, \prec, \pi \rangle)$. Otherwise, $a_{dict} \in$ minimal$(\langle \mathcal{L}, \prec, \pi \rangle)$. The first case happens when most agents are less patient than the average agent. Then, the dictator is the most patient agent. Conversely, in the second case, the dictator is the less patient agent; this is opposed to the majority, which is patient. This definition, therefore, represents the fact that a dictatorship must represent the government of a minority.

To ensure the soundness of these characterizations we have to consider the following:

Proposition 3 *For a given $\langle \mathcal{L}, \prec, \pi \rangle$, a_{dict}, a_{maj} and a_{demo} are in $\mathcal{L}$ and are time invariant.*

Proof of Proposition 3 *By definition a_{dict} and a_{maj} are particular elements in $\mathcal{L}$. On the other hand, since $a_{demo} = \int_{\mathcal{L}} \pi(\phi^{-1}(\rho))\phi^{-1}(\rho)d\phi^{-1}(\rho)$, it is the average of $\phi^{-1}(\rho)$. But ϕ is a continuous bijection and therefore a_{demo} =*

[8] Of course, this is an oversimplification. As a political system, dictatorship cannot be characterized by an unambiguous definition. In this sense, the evidence shows that there several kinds of dictatorship, some of them "good", some "bad", for growth. The "good" dictatorships follow policies favorable to socioeconomic development, while the "bad" ones disregard social welfare and care only for the wealth of their supporting group (see Alesina and Perotti(1994)). In any case, our characterization tries to capture the empirical fact that dictators tend to carry out "unpopular" policies. Even so, dictators need to have some consensus to avoid being overthrown. This matters for the issue of instability that will be discussed in Section 4.

[9] See a survey of the distinctions between majoritarian and proportional systems in Persson and Tabellini (2000).

$\phi^{-1}(Average(\Psi))$. $Average(\Psi) \in \Psi$ since Ψ is a closed interval. Therefore $a_{demo} \in \mathcal{L}$.

Finally, since π is time invariant a_{demo} must be time invariant. As a_{maj} is also, by definition, time invariant, a_{dict} must be (as depending both on a_{maj} and a_{demo}) constant through time. □

Now we can to compare the steady states for each political systems. This is not independent from the distribution of income and time preferences, which in the following is characterized in terms of properties of the time-invariant probability distribution π.

The most important feature of π in our analysis is the third moment of the distribution: the degree of skewness. This indicates where the mass of agents is located with respect its mean and the median. As it is standard, π is a distribution with positive skewness if the median is to the left of the mean, and with negative skewness otherwise. Therefore, two generic cases must be considered:[10]

- π **has negative skewness**: then $a_{dict} \prec a_{demo} \prec a_{maj}$. Therefore, $y^*_{dict} < y^*_{demo} < y^*_{maj}$.
- π **has positive skewness**: there $a_{maj} \prec a_{demo} \prec a_{dict}$. But then $y^*_{maj} > y^*_{demo} > y^*_{dict}$.

As it can be seen, only the (less common) first case coincides with Barro's inverted U (see Figures 1 and 2). In this case the dictator is the less patient agent in the society. This fact pushes the dictatorial steady state to the lowest level of output and consumption. An increase in political participation means to change from the dictator to the median agent, who is above the average, and therefore is more patient. This ensures a higher steady state value. A full democracy induces the participation of minorities in decision making. The ex-dictator preferences influences again the public policies and therefore balances the preferences of the majority, pushing the economy towards a lower steady state path, because it is associated to a higher rate of preference. Therefore, the highest steady state value is that of the majority rule, while the less and more participative regimes exhibit lower values.

On the other hand, in the case of positive skewness the dictator is the more patient, leading to the highest steady state. The majority rule depresses that value by shifting preferences towards a higher rate of time preference. Full democracy improves the steady state values but not enough to recuperate the levels attained during the dictatorship. This happens because the preferences of the more patient are again taken into account.

In short, the more common case of a positive skewed income distribution yields a straight U shape in the "political participation- growth" relation. This contrasts sharply with Barro's inverted U. Nevertheless, the economies studied by Barro show a common trait, albeit in different degrees, namely some sort of social and political instability, while our model does not include so far this

[10]We disregard the case of zero skewness, since it is not generic.

feature. We will show that these results can be modified if SPI is introduced. If executives are in office only for a short period, their plans must be modified, so that the growth plan for the economy will be affected. In fact, the inclusion of SPI will allow us to obtain an inverted U for the more common case of a positive skewed income distribution. This is discussed in the next section.

4 Sociopolitical Instability

Sociopolitical instability is measured by the shortening of the executive's permanence in office. A shorter time in office, and therefore a higher turnover rate, implies more frequent changes of policies and so higher instability. Constitutional governments have, in general, finite and preordained horizons; but political unrest induces, at least, partial changes of the highest positions in the executive (ministers, secretaries, etc.).

In our stylized presentation, the presence of SPI is indicated by a finite horizon, $t < \infty$. A low t is a signature of high instability, and vice versa (of course, the infinite horizon is equivalent to the inexistence of instability). The executive is not sure about the actual value of the turnover moment, t. We assume that, despite this, the executive can estimate a $\bar{t}$, an expected value of t.

The response of an executive to $\bar{t} < \infty$ is assumed to be independent from the political regime. The optimal growth path for an infinite horizon indicates the planned consumption for all times. If the horizon shortens, the executive increases the rate of time preference and the consumption level during the period in office. The intuition is that a shortening of the time in office induces the executive to try to compensate for his expected loss of utility after $\bar{t}$. To reduce that loss the executive consumes more, until the end of his period in office, than the amount specified in his optimal plan. Hence, the economy will tend toward a different steady state, with a higher consumption and lower accumulation at its early stages, and a lower steady state in the long run.

The argument is as follows. The executive assumes a decreasing probability of staying in office after time t, $\Omega(t)$, defined for $t \in [0, \infty)$. Therefore $\dot{\Omega}(t) < 0$, and for simplicity we assume that the probability of survival has a constant variation rate $\frac{\dot{\Omega}(t)}{\Omega(t)}$ for $t < \bar{t}$ while it is 0 afterwards. The problem of the executive now becomes to optimize the lifetime utility taking this fact into account. That is, the new goal is to maximize the following functional:[11]

$$\int_0^{\infty} \Omega(t) u(c(t)) e^{-\rho_i t} dt$$

subject to

$$\begin{aligned} \dot{k} &= f(k) - c \\ k(0) &= k_0 \end{aligned}$$

[11] See Yaari(1965) for a discussion on the problem of consumer behavior in the case of uncertain lifetime.

$$\lim_{t \to \infty} k(t) \geq 0$$

where the constraints are assumed to be satisfied with probability one. Recasting the solution discussed in Proposition 1 we have that the Hamiltonian for this problem is now:

$$H(c, k, \lambda) = \Omega(t) u(c(t)) e^{-\rho t} + \lambda(f(k(t)) - c(t))$$

Its optimization yields two first-order conditions:

$$\Omega(t) e^{-\rho t} u^{'}(c) = \lambda$$

$$f^{'}(k) = -\frac{\dot{\lambda}}{\lambda}$$

Taking logarithmic derivatives and combining both expressions we get:

$$-\rho + \frac{u^{''}(c)}{u^{'}(c)} \dot{c} + \frac{\dot{\Omega}(t)}{\Omega(t)} = -f^{'}(k)$$

Again, assuming a constant elasticity of substitution, $\sigma = -\frac{u^{'}(c)}{cu^{''}(c)}$, we have that

$$\frac{\dot{c}}{c} = \sigma \cdot (f^{'}(k) - \rho + \frac{\dot{\Omega}(t)}{\Omega(t)})$$

which, in steady state, yields $f^{'}(k) = \rho - \frac{\dot{\Omega}(t)}{\Omega(t)}$, for $t < \bar{t}$. Since $\frac{\dot{\Omega}(t)}{\Omega(t)} < 0$ this means that the new adjusted time preference, $\rho^{'} = \rho - \frac{\dot{\Omega}(t)}{\Omega(t)}$, is higher than ρ and therefore leads to a lower steady state. Furthermore, we can see that for $t = \bar{t}$ both rates of time preference coincide (since $\frac{\dot{\Omega}(t)}{\Omega(t)} = 0$ for $t \geq \bar{t}$), indicating that the time paths with and without instability intersect at $\bar{t}$.

In other words, the executive a, given her or his time preference ρ_a and the optimal plan for an infinite horizon, $\{c^*(t)\}_{t=0}^{\infty}$, chooses an alternative time preference $\rho_a^{'} > \rho_a$. The new time preference is such that the corresponding optimal plan, $\{c^{'}(t)\}_{t=0}^{\infty}$, verifies $c^{'}(t) \geq c^*(t)$ for every t, $0 \leq t \leq \bar{t}$, $c^{'}(\bar{t}) = c^*(\bar{t})$, and $c^{'}(\bar{t}) < c^*(\bar{t})$ for every $t > \bar{t}$.

The rationale for this behavior is that, although the executive wants to consume more during her or his period in office, to overconsume or even to force a collapse of the economy, is not an optimal behavior. Since the executive is not sure about the actual $\bar{t}$, she or he will not have incentives to consume the entire capital stock in a finite period.[12] Hence, $k > 0$ for every finite t. It is evident that the executive has to select an alternative path that leads to non-zero steady states. In turn, since higher consumption benefits the executive mainly during the period in office, there seems to be no advantage in choosing a path where consumption keeps higher, after leaving the office, than in his preferred path . To show that there exists such a choice we state the following:

[12]This fact explains why the problem that the executive faces is *not* a finite-horizon optimization.

Proposition 4 *For each feasible time preference* ρ_a^* *there exists a unique* ρ_a' *yielding a plan* $\{c'(t)\}_{t=0}^{\infty}$ *such that* $c'(t) \geq c^*(t)$ *for every* t, $0 \leq t \leq \bar{t}$, $c'(\bar{t}) = c^*(\bar{t})$, *and* $c'(t) < c^*(t)$ *for every* $t > \bar{t}$.

Proof of Proposition 4 *Trivial. The solution of the Ramsey problem yields a unique monotonic growth path for a given feasible rate of time preference. Two paths,* $\{c_1(t)\}_{t=0}^{\infty}$ *and* $\{c_2(t)\}_{t=0}^{\infty}$, *each corresponding to a different time preference, say* $\rho_1 > \rho_2$, *are such that* $c_1(0) > c_2(0)$ *while their steady states verify* $c_1^* < c_2^*$. *Since both paths are monotonic, they cross only once. On the other hand, given a plan* $\{c^*(t)\}_{t=0}^{\infty}$ *and* $t = t^*$ *there exists one and only one plan (and therefore a feasible* $\rho \in \Psi$*) that crosses* $\{c^*(t)\}_{t=0}^{\infty}$ *at* t^*. *Therefore, there exist only one* ρ *that yields a plan that crosses the optimal plan at* $t = \bar{t}$ *(see Fig. 3).* □

Hence, there exists a one-to-one function $\phi_{\bar{t}} : \Psi \rightarrow \Psi$, where $\Psi \subseteq \Re^+$ is the closed interval of feasible time preferences. This function is such that $\phi_{\bar{t}}(\rho_a) = \rho_a'$. The properties of $\phi_{\bar{t}}$ are summarized in the following:

Theorem 1 *For a given* $\bar{t}$, $\phi_{\bar{t}}$ *is a continuous and differentiable function, such that* $\frac{d\phi_{\bar{t}}}{d\rho} \geq 0$ *and* $\frac{d^2\phi_{\bar{t}}}{d\rho^2} \leq 0$.

Proof of Theorem 1

- continuity*: Given an* $\epsilon \approx 0$ *and two rates of time preference* $\rho_1, \rho_2 \in \Psi$, *such that* $|\phi_{\bar{t}}(\rho_1) - \phi_{\bar{t}}(\rho_2)| < \epsilon$ *it is clear that the corresponding growth paths are close. In fact, since in steady state* $f'(k_i^*) = \phi_{\bar{t}}(\rho_1)$ *and* $f'(k_{ii}^*) = \phi_{\bar{t}}(\rho_2)$, $|f'(k_i^*) - f'(k_{ii}^*)| < \epsilon$. *Therefore, as* f' *is a continuous function,* $k_i^* \approx k_{ii}^*$, *and consequently* $c_i^* \approx c_{ii}^*$ *and* $y_i^* \approx y_{ii}^*$. *Moreover,* $c_i(t) \approx c_{ii}(t)$ *for any* $t > 0$. *As the corresponding paths for* ρ_1 *and* ρ_2 *are such that* $c_i(\bar{t}) = c_1(\bar{t})$ *and* $c_{ii}(\bar{t}) = c_2(\bar{t})$, *by transitivity it follows that* $c_1(t) \approx c_2(t)$, *i.e. that* $\rho_1 \approx \rho_2$. *More precisely, that there exists a small* δ *such that* $|\rho_1 - \rho_2| < \delta$.

- differentiability*: Suppose that* $\phi_{\bar{t}}$ *is not differentiable. Therefore, it has to exist an* $\epsilon > 0$ *such that for every* $r \in \Re$ *and for all* $\delta > 0$ *it must be true that for any pair* $\rho_1, \rho_2 \in int(\Psi)$, $|\rho_1 - \rho_2| < \delta$ *and* $|\frac{\phi_{\bar{t}}(\rho_1) - \phi_{\bar{t}}(\rho_2)}{\rho_1 - \rho_2} - r| > \epsilon$. *In other words, no matter how close is* ρ_1 *to* ρ_2, $\frac{\phi_{\bar{t}}(\rho_1) - \phi_{\bar{t}}(\rho_2)}{\rho_1 - \rho_2}$ *is beyond any bound. But if* ρ_1 *is close to* ρ_2, *in steady state (since* $f' = \rho$*)* $f'(k_1^*), f'(k_2^*)$ *are also close. Moreover, by continuity,* $f'(k_i^*)$ *and* $f'(k_{ii}^*)$ *are also close. Finally, is* $\frac{f'(k_i^*) - f'(k_{ii}^*)}{f'(k_1^*) - f'(k_2^*)}$ *is bounded, since* f' *is differentiable. Absurd. Therefore* $\phi_{\bar{t}}$ *is differentiable.*

- first order condition*: by definition* $\phi_{\bar{t}}(\rho) \geq \rho$. *Therefore,* $\phi_{\bar{t}}$ *is monotonically increasing. As it is also differentiable, it verifies that* $\frac{d\phi_{\bar{t}}}{d\rho} \geq 0$.

- second order condition*: first of all, the derivative of a monotonically increasing continuous function is also continuous and differentiable. Moreover, it is can be either a constant, a monotonically increasing or a monotonically decreasing function. We want to show that* $\frac{d\phi_{\bar{t}}}{d\rho}$ *is monotonically* *decreasing. Suppose that it is not. This means that*

$$\frac{d\phi_{\bar{t}}(\rho_1)}{d\rho} \leq \frac{d\phi_{\bar{t}}(\rho_2)}{d\rho}$$

for $\rho_1 < \rho_2$. *That is, for an arbitrarily small* $\Delta\rho > 0$,

$$\frac{\phi_{\bar{t}}(\rho_1 + \Delta\rho) - \phi_{\bar{t}}(\rho_1)}{\Delta\rho} \leq \frac{\phi_{\bar{t}}(\rho_2 + \Delta\rho) - \phi_{\bar{t}}(\rho_2)}{\Delta\rho}$$

which is equivalent to

$$\phi_{\bar{t}}(\rho_1^{'}) - \phi_{\bar{t}}(\rho_1) \leq \phi_{\bar{t}}(\rho_2^{'}) - \phi_{\bar{t}}(\rho_2)$$

where $\rho_j^{'} = \rho_i + \Delta\rho$ *for* $j = 1, 2$, *and therefore* $\rho_j^{'} > \rho_j$. *Since* $\phi_{\bar{t}}$ *is monotonic, we have that* $\rho_i^{'} = \phi_{\bar{t}}(\rho_1^{'}) > \phi_{\bar{t}}(\rho_1) = \rho_i$ *and* $\rho_{ii}^{'} = \phi_{\bar{t}}(\rho_2^{'}) > \phi_{\bar{t}}(\rho_2) = \rho_{ii}$. *In consequence*

$$\rho_i^{'} - \rho_i \leq \rho_{ii}^{'} - \rho_{ii}$$

This implies, in steady state,

$$f^{'}(k_i^{'*}) - f^{'}(k_i^*) \leq f^{'}(k_{ii}^{'*}) - f^{'}(k_{ii}^*)$$

where $k_i^{'*} < k_i^*$ *and* $k_{ii}^{'*} < k_{ii}^*$. *But* $f^{'}$ *is a decreasing function. Therefore*

$$f^{'}(k_i^{'*}) - f^{'}(k_i^*) > f^{'}(k_{ii}^{'*}) - f^{'}(k_{ii}^*)$$

Absurd. Thus, $\frac{d^2\phi_{\bar{t}}}{d\rho^2} \geq 0$. □

We have considered, until now, the effect of SPI on the adjustment towards lower steady-state values independently of the political regime. But this leaves aside the fact that SPI differs from a regime to another. In fact, as we said before, dictatorships (at least the kind that we defined) face a huge opposition and are not legitimated by a due electoral process. This indicates that they must be more unstable than the other two regimes.[13] In other words we assume that the probability of staying in office Ω_{dict} is first-order stochastically dominated by Ω_{maj} and Ω_{demo}.[14] On the other hand, what we called full democracy, the result of proportional (parliamentary-like) electoral systems, usually exhibit notorious instabilities arising from the fact that they must balance many disparate forces. Majority rule regimes, instead, seem to have a better record of stability[15] That

[13]This is particularly true of the unsuccessful dictatorships of Africa and Latin America. Other cases, like Pinochet in Chile as well as some dictators in South East Asia, remained in power for a long time. The wide social support received by these dictatorships allows us to conjecture that their dictatorships constituted some sort of "degenerate" majority rule regime.

[14]This means that for every nondecreasing $f : [0,\infty] \rightarrow [0,\infty]$, $\int_0^\infty f(t)\Omega_{demo}(t)dt \geq \int_0^\infty f(t)\Omega_{dict}(t)dt$ and $\int_0^\infty f(t)\Omega_{maj}(t)dt \geq \int_0^\infty f(t)\Omega_{dict}(t)dt$.

[15]Just compare the remarkable stability of American-like democracies, which are majority rule regimes, with the frequent turnover of parliamentary regimes like those in Europe. Of course, this is again an approximation, which can be easily confronted with counterexamples (Kohl in Germany, for example).

is, Ω_{demo} is first-order stochastically dominated by Ω_{maj}. For simplicity we assume that $\Omega_{dict}(t) \leq \Omega_{demo}(t) \leq \Omega_{maj}(t)$, for each t. In consequence, we can safely assume that $\bar{t}$ is different for each regime:

$$\bar{t}_{dict} < \bar{t}_{demo} < \bar{t}_{maj}$$

A consequence of the previous discussions is that the higher the agent's patience the higher the adjustment of time preference when SPI is introduced. This is because a patient agent at period $\bar{t}$ is far from being in a steady state, and therefore this agent is more willing to increase consumption than an agent who is close to his own steady state. This is reinforced by the adjustment induced by the aforementioned inherent instability of the political regimes. So, in the more common case of a positively skewed income distribution, the dictator (which is already the most patient agent) has to face the shortest finite horizon $\bar{t}_{dict}$. Therefore, she or he has to increase consumption in such a way that it will lead, *ceteris paribus*, to a lower steady state, both because of her or his ideal steady state is far away in any case, as well as because his time in office is shorter than that of the executives of the other regimes. This puts her or his *actual* time preference closer to that of the other representatives, and it may even swap positions with them. This may lead to a situation where the straight U becomes a flat curve or it may even bend down, resembling Barro's inverted U (see Fig. 4).

Formally, when the temporal horizon changes to $\bar{t}' < \bar{t}$, the new adjustment function, $\phi_{\bar{t}'}$ exhibits properties analogous to $\phi_{\bar{t}}$. The new time preference, ρ_a'', yields a lower steady state, as shown in the following

Proposition 5 *$\phi_{\bar{t}'}$ is such that the plan corresponding to $\rho_a'' = \phi_{\bar{t}'}(\rho_a)$, $\{c''(t)\}_{t=0}^{\infty}$ tends towards a steady state value $c''^* < c'^*$, where c'^* is the steady state corresponding to $\rho_a' = \phi_{\bar{t}}(\rho_a)$.*

Proof of Proposition 5 *$\{c''(t)\}_{t=0}^{\infty}$ verifies that $c''(t) \geq c^*(t)$ for every t, $0 \leq t \leq \bar{t}'$, $c''(\bar{t}') = c^*(\bar{t}')$, and $c''(t) < c^*(\bar{t}')$ for every $t > \bar{t}'$. Comparing the new path to the path obtained from ρ_a, $\{c'(t)\}_{t=0}^{\infty}$, it follows that $c''(t) \leq c^*(t) \leq c'(t)$ for $\bar{t}' \leq t \leq \bar{t}$, and particularly that $c''(\bar{t}) < c^*(\bar{t}) = c'(\bar{t})$. Since the paths are monotonic, $c''(t) < c'$ for $t > \bar{t}'$. Therefore, the steady states are such that $c''^* < c'^*$.* □

In short, a shorter horizon yields a lower steady state. In terms of the relation between political participation and growth, this means that the steady states corresponding to each political regime are lower than when the executives face a longer time in office. With an analogous argument as the given above, it is clear that the most affected will be again the more patient agents. In the more common case of a positively skewed income distribution, the adjustment of a dictatorship is higher than that of a full democracy and still higher than a majority rule regime. Therefore, the introduction of SPI in the model would allow us to obtain theoretical predictions which are compatible with Barro's empirical findings: an inverted U shape of the "political participation-growth" relation.

5 Conclusions and Further Research

In this paper we found a theoretical negative relation between political instability and economic growth. As a first step, our model emphasizes that time preferences affect growth: a higher degree of impatience leads to a lower steady state income. On the other hand, by introducing political regimes, the relative magnitude of steady states depends on the shape of the income distribution. Each regime chooses a representative agent, which constitutes a particular element of the distribution (the mean, the median, and a maximal or a minimal agent). The relative position of the representatives is determined by the skewness of the income distribution. This indicates the kind of relation between political participation and steady states. Without SPI only the less common case of a negative skewness conduces to an inverted U shape of the relation between political participation and economic growth.

Sociopolitical instability, represented here by the shortening of executive's permanence in office, changes the relation between political regimes and steady states. Executives who face a shorter period adjust their consumption path, and therefore time preferences, in order to consume more while in office, but without exhausting the capital stock of the economy. This is performed in such a way that the more patient executives end up adjusting their consumption paths far more than the less patient. This is because a patient agent is, at a given time period, farther away from the steady state than a more impatient individual, who cannot increase much more his consumption without falling in an infeasible path.

Therefore, once instability is introduced, in the more common case of a positive skewness of the income distribution, the dictator is the most patient executive and faces the strongest instability. On the other hand, the majority rule representative is the most impatient but also the most stable. If all the executives know they will stay in office only for a finite period, they will adjust their consumption paths. The expectations of time in office differ from regime to regime, depending on their inherent amount of conflict. The dictator will adjust proportionally more than the others, while the majority rule executive will adjust less. If the time preferences of the executives differ widely, it is possible that the U shape becomes transformed in a flat relation or even in something closer to Barro's inverted U shape. This could explain how a positively skewed income distribution could lead to an inverted U shape. This case seems to be intuitively more common because societies usually exhibit a majority of low income, and a few rich agents. This is the basic fact that can be derived from the analysis of the Pareto distribution. Even without resorting to a deeper explanation, socio-political instability, in the context of the three political regimes presented in this paper, provides an alternative explanation for the empirical evidence on participation and growth. Finally, further work involves the introduction of a market system (instead of considering growth based on the accumulation of a public good). On the other hand, it could be interesting to consider the instability as endogenous to the inequality of income, in a stylization of the findings in Alesina and Perotti (1996).[16] Both extensions require a major reworking of the basic models presented here and nothing ensures that the results found here will remain valid.

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