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Power in Economics: Growth, Inequality and Politics

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Power in economics: Growth, inequality and politics

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Abstract. We study the economy-wide implications of economic power. We examine the distribution of bargaining power between the owners of capital ("the capitalists") and the owners of human capital ("the workers") and its effects on fundamental economic variables, including economic growth, efficiency, and inequality. We introduce an integrated theory of distribution which combines the marginal and Nash theories of distribution, where factor returns are determined in a context of capital market imperfections. We show that all the fundamental economic variables, including economic power, are in fact dependent on political conditions. Explicit recognition of economic power as a key factor allows us to integrate economic and political conditions in a natural way, where economic power constitutes the fundamental linkage between politics and economics. Political conditions determine an equilibrium for the fundamental economic variables and these variables, in turn, affect the subsequent political equilibrium. We show that the performance of the economy is likely to be cyclical because of the cyclical behavior of the political conditions and vice versa, political cycles are in part originated in economic cycles.

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Power in economics: Growth, inequality and politics

Introduction

The economy-wide implications of *economic* power within a neo-classical framework have not been explored.[1] This is so in spite of the existence of some models that might provide micro foundations for its treatment.[2] The analysis of asymmetrical bargaining power started with the seminal works by Nash in the early 1950s which gave rise to a large literature extending such model in several directions (e.g., Busch and Muthoo, 2003; Muthoo, 2001; Rubinstein, 1982). A distinctive feature of studies using a Nash framework is that they assume the degree of bargaining power of economic agents as exogenously given. Another branch of the literature examines economic power in models of predation and conflict among private individuals or firms (including, for example, Hirschleifer, 1991; Grossman and Kim, 1995 and 1996a). These studies have in common that their treatment of power is strictly partial equilibrium with rare references to potential economy-wide implications, particularly economic growth and distribution. While the predation and conflict literature does allow for economic power to be endogenous dependent on the resources used in predation and defense, it does not explicitly consider the role of politico-institutional factors which are likely to be non-neutral, in the sense that such factors may affect the level of economic power of individuals and firms in a differential manner.

In the meantime, growth models, whether classical or the more recent endogenous growth models, rarely consider economic power as a factor affecting the rate and orientation of economic growth.[3] While some models do consider the implications of market imperfections for economic growth, most of them consider these imperfections as exogenously given. However, as we show below economic power and market imperfections are closely linked, which suggest that a proper treatment of power needs to account for endogenous market imperfections. The endogeneity of market imperfections throughout the growth process has been mostly ignored by the endogenous growth literature.

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[1] We focus on economic as opposed to political power, which is a subject widely studied by the recent literature including Acemoglu (2008), Acemoglu and Robinson (2008), among several others.

[2] Outside the realm of neoclassical economics, the study of economic power has been important (see, for example, Harvey, 2003; Ozzane, 2015, Bartley, 2003, and others). While these studies have brought interesting issues generally ignored by mainstream economics, their value is limited by their mostly descriptive nature and by using conceptual categories fundamentally different from mainstream economics.

[3] An exception is the article by Grossman and Kim (1996b) which considers certain aspects of power for the accumulation of capital. They look at the implications of predation and defensive expenditures as competitors with investments in capital accumulation.

This paper has two objectives: First, to examine the determination of the distribution of power between the owners of capital ("the capitalists") and the owners of human capital ("the workers") and its relationship with the fundamental economic variables, including market imperfections, economic growth as well as income distribution between capitalists and workers.[4]

The analysis here follows an old tradition of classical development economists by focusing on discovering long run patterns of economic growth and distribution of income between capitalists and workers.[5] Consistent with this tradition we also focus on the balanced growth equilibrium of the fundamental economic variables rather than on the transitional dynamics of them. However, one fundamental difference with the classical analyses is that workers are not viewed merely as individuals that sell a fixed work force, but instead they are able to enhance their work force by investing in human capital or skills, which in turn, facilitates their capacity to develop new ideas and ultimately to generate technological advances. Thus, to the extent that as we shall see later, human capital endogenously changes over time, this specification allows one to at least partially capture endogenous productivity change.[6] It turns out that by considering labor in a human capital investment perspective, the conclusions regarding the evolution of a capitalist economy change in a surprisingly profound manner when such perspective is combined with a power angle.

An important contribution of this paper is that it introduces an integrated theory of distribution which combines the marginal and Nash theories of distribution, where factor returns are determined in a context of capital market imperfections. This theory of distribution enriches the conventional marginal distribution paradigm, showing that factor rewards depend on their respective degree of endogenously-determined bargaining power, and moreover that the effects of productivity changes on factor returns are affected by their bargaining power.

Another important difference with the classical approach is that we explicitly allow for the role of policies arising from political regimes which endogenously change over time as a factor affecting economic power distribution and hence income distribution, efficiency and economic growth.

This brings us to the second objective of this paper: To study the interdependence between politics and economics with a focus on established democracies with stable

[4] Capitalists here do not include only the direct owners of capital, but also those "workers" such as top executives and financial traders whose income directly depends on the returns to capital. This also applies to our concept of distribution between labor income and capital income. "Labor" income of top executives, financial traders and in general people obtaining their income mainly from rents associated with their proximity to capital, is regarded as part of capital income.

[5] Piketty (2014), following the steps of Marx, Ricardo and several other classical economists, is of course the most acclaimed modern work in this respect.

[6] This is consistent with the views of Uzawa (1965) and, more recently, of Lucas (1988) who argue that human capital and technological knowledge are one and the same.

political institutions as opposed to analyses that look into changing institutional and political structures.[7] We consider economic power, more specifically its distribution among workers and capitalists, as a key bridge between political conditions and the fundamental economic variables. Changing political regimes generates policies that directly impinge upon the distribution of economic power which, in turn, leads to the determination of efficiency, growth and inequality.

We show that the political regimes and their interventions impacting the distribution of economic power in a democratic society may not converge to a unique stable equilibrium but rather follow long cyclical processes over time. This cyclical political process is replicated in economic cycles and economic cycles in turn may perpetuate political cycles. We show that the performance of the economy is likely to be cyclical because of the cyclical behavior of the political conditions and vice versa, political cycles are in part originated in economic cycles. To an extent, economic cycles and political cycles are mirror images of each other.

The political model developed in this paper departs quite considerably from the standard models of political competition (Downs, 1957; Roemer, 2001 and 1995; Wittman, 1990; Schultz, 1995). First, we argue that established political parties representing either workers' or capitalists' interests, have a very limited space for strategic games to access or retain power, because the electorate would be hard-press to believe too drastic departures from the parties' well-known reputation as defenders of such interests. This is in sharp contrast with the assumptions used by the standard literature which assumes that politicians are opportunistic and play Nash to maximize their chances to access or retain political power, thus leading to a convergence of the political proposals.[8]

Second, we consider the preferences of the median voter to endogenously change over time, which is a key source of political cycles. The median voter´s preference is in fact a moving target which, given its endogenous dynamics, is very difficult to predict by a political party (this is another reason why it might be quite futile for the parties to play Nash by trying to assimilate their proposals to the hard-to-predict preferences of the median voter). By contrast, most of the standard literature assumes that the preferences of the median voter are fixed and known ex-ante; only the analyses considering uncertainty allow the preferences of the median voter to change but purely due to stochastic factors (such as the weather conditions in election day).

[7] See, for example, the study by Acemoglu et.al (2008) on institutional determinants of the dynamics of economic variables.

[8] This is not only valid for Downs's and related literature which avoids assuming ideological political parties but also for the literature initiated by Wittman (1990) which concludes that in long run equilibrium political parties by playing Nash, converge to similar proposals and their chances to be elected are 50%. There is a literature allowing for uncertainty regarding the median voter which concludes that ideological political parties also play Nash but that their proposals do not entirely converge (Roemer, 1995). In this case political cycles are predicted but the cycles are merely originated in stochastic dynamics.

One may consider our approach as an alternative parable to the standard political equilibrium one. Both the standard and ours are highly stylized paradigms of political equilibrium. The Downs's and followers' model can be regarded as one extreme benchmark to study political equilibrium; ours may be considered the other missing and polar benchmark. Both benchmarks are of course unrealistic, indeed if were not for the advantage of familiarity and time in existence of the Downs-inspired approach (and the attractiveness that the mathematizing of these models exerts for the increasingly "quantitative" social scientists), one may not *a priori* prefer one over the other. The ultimate test is the empirical one arising from the alternative predictions arising from each model.

Some of the most influential studies in the field have focused on how politics, particularly political instability, affects mainly short term economic variables, implicitly assuming a one-way causality from political to economic conditions (Alesina and Sachs, 1988; Rodrik, 1991; Alesina et.al., 1996; Jong-a-P, 2009; Campos and Nugent, 2002 and Aisen and Veiga, 2011). Similarly, there is a broad literature examining the effects of election outcomes on the macroeconomic performance (Blinder and Watson, 2016; Alesina et.al., 1997; Comiskey and Marsh, 2012). In contrast, our analysis considers political behavior as both cause and effect of long term economic variables.

Another literature considers interconnected economic and political cycles. However, the interconnected cycles arise from exogenous economic shocks that impact political leadership (e.g., Ales et.al, 2012) or from politically-induced economic shocks caused by either opportunistic or partisan politicians to increase the likelihood of reelection (e.g., Rogoff, 1990 and Alesina et.al., 1997, respectively).[9] By contrast, unlike most existing analyses we consider that both the economic and political cycles are truly endogenous, their existence not depending on exogenous shocks nor on opportunistic politicians striving to remain in power. To borrow from Arthur Schlesinger´s insightful comment, these cycles are "self-generating and autonomous" (Schlesinger, 1999). Even in the complete absence of external shocks the economic and political cycles may take place as a natural response to endogenous forces associated with the close interdependence between economics and politics.

This study is somehow akin to a large number of studies highlighting political cycles relating them to cycles in the economy, cycles characterized by a regular periodicity (e.g., Berry, 1991 and Burnham, 1970). Unlike this literature, we postulate that political cycles do not necessarily originate on economic cycles and that economic cycles can also be regarded as being induced by political cycles. Another view on cycles is provided by Roemer (1995). He uses a model which combines uncertain electoral outcomes and

[9] Most of the existing literature on political cycles focusses on short run political changes and their effects on also short run macroeconomic outcomes such as inflation, budget deficits and the likes. We consider more structural policies where parties differentiate among each other on the orientation of structural policies which impinge upon economic power, distribution and economic growth over the medium or long term.

gradual changes in voters´ preferences to predict the existence of stochastic political cycles with alternating political parties in power. We use a deterministic model with endogenous and hard-to- predict changes in preferences of the median voter which results in continuous, non-stochastic cyclical political processes. While Roemer focusses on a limited range of economic changes (i.e., the changes in the provision of a public good) as a source of political cycles, we integrate the political model to a fully specified economic model. Neither does he consider economic power in his model as we do here.

The economic model

Production. We consider two productive assets or factors of production, physical capital (K) and human capital (H) which jointly produce a single good through an aggregate constant-returns-to-scale production function, $F(K,H)$, assumed to be CES,[10]

$$\mathrm{F(K,H)} = \left[\mathrm{aK}^{\frac{\sigma-1}{\sigma}} + (1-\mathrm{a})\mathrm{H}^{\frac{\sigma-1}{\sigma}}\right]^{\frac{\sigma}{\sigma-1}} \qquad (1)$$

where $0 < \mathrm{a} < 1$ is a parameter and σ is a fixed parameter representing the elasticity of substitution. We assume throughout this study that human capital and physical capital are gross substitutes ($\sigma > 1$). While most empirical studies have found that capital and labor are gross complements, studies that allow for embodied technological change (as we consider here by using endogenous human capital rather than merely labor) and that focus on long run estimates find that these factors are gross substitutes (Duffy and Papageorgiou, 2000; Karabarbounis et. Al., 2014).

A fundamental balanced growth equilibrium. The following proposition is shown in the appendix.

Proposition 1 **(on balanced growth equilibrium with perfect capital markets)***. Assuming perfect capital markets, multi asset growth models that converge to a balanced growth path often yield the equalization of the assets' net marginal products as a fundamental long run equilibrium condition.*

Proof*. See appendix.*

This extraordinarily simple result is a fundamental long run equilibrium condition (or, to put it in the jargon of endogenous growth models, "balanced growth" condition) arising from a surprisingly large number of multi asset endogenous growth models, including for example Barro and Sala-I-Martin (2004), Lucas (1988), Aghion and Howitt (1998), Mino

[10] Here "human capital" is an asset that is owned by workers (which may include education, health and skills that affect the productivity of workers), most of the population. The term "physical capital" refers to all forms of capital other than human capital which are owned by capitalists, a relatively small fraction of the population.

(1997), and several others.[11] To reduce algebraic clutter, we assume without loss of generality zero rates of depreciation for both assets. Hence in balanced growth equilibrium,

$$\mathrm{F}_K\left({}^{K}/_{H}, 1\right) = \mathrm{F}_{\mathrm{H}}\left({}^{K}/_{H}, 1\right) \qquad (2)$$

Where $\mathrm{F}_{\mathrm{K}}\left({}^{K}/_{H}, 1\right)$ represents the net marginal product of physical capital and $\mathrm{F}_{\mathrm{H}}\left({}^{K}/_{H}, 1\right)$ is the net marginal product of human capital.

From equations (2) and (1) we obtain an equilibrium level of the capital to human capital ratio,

$$\left(\frac{\mathrm{K}}{\mathrm{H}}\right)^{*} = \left(\frac{\mathrm{a}}{1-\mathrm{a}}\right)^{\sigma} \qquad (3)$$

Importantly, the fact that this condition emerges as a long run condition for balanced growth means that it must be interpreted in a dynamic fashion. The K/H ratio is kept constant in balanced growth equilibrium not because K and H are constant but because both assets *grow at the same rate*. This is the reason why the economy may exhibit a positive rate of growth in long run equilibrium. More on this later.

Nash power and distribution. As a benchmark of the power component of the analysis, we use the asymmetric Nash bargaining model (Nash, 1950) focusing on the owners of physical capital (the "capitalists") and the owners of human capital (the "workers"), having different degrees of bargaining power, who bargain for a share of a given level of output that they may jointly produce. The fact that factor owners derive their income from the bargaining process justifies referring to it as the *Nash theory of distribution*. As shown by Muthoo (2001), the bargaining outcome that the asymmetric Nash bargaining generates is identical to the outcome obtained by the widely praised alternating-offers model developed by Rubinstein´s seminal article (Rubinstein, 1982).[12] Thus, the bargaining outcome implies that the relative shares of physical capital owners and human capital owners are proportional to their respective degree of bargaining power. While Rubinstein in his original article interprets the relative bargaining power of each agent as exclusively dependent on his/her relative discount factor, the discount factor can have a broader interpretation reflecting various costs of haggling. This may include the influence of imperfect markets or third parties including that of the state through public policies and other political institutions, all having the potential of biasing the bargaining power in favor of either capitalists or workers (Muthoo, 2001).

[11] However, more complex models may have multiple equilibria and others may not even converge to any equilibrium (Gaspar et.al, 2014).

[12] The bargaining literature focusses on "players" as individuals, but as Muthoo (2001) emphasizes one can interpret the term "player" as organizations or as agents representing groups with similar interests such as "capitalists" owning mostly physical capital and "workers" owning mostly human capital, as we do here.

Factor market equilibrium with perfect markets and distribution. The following proposition emerges from the analysis of distribution assuming perfect markets.

Proposition 2. *If capital markets are perfect the marginal theory of factor distribution and the asymmetric Nash bargaining theory may be incompatible.*

Proof. *If factor asset owners are paid their respective marginal productivities then the relative factor payments are* $\frac{y^k}{y^h} \equiv \frac{KF_k}{HF_H}$. *Thus, the marginal theory of distribution would imply (using the CES specification for the production function) that the relative factor payments are* $\frac{y^k}{y^h} = \frac{a}{1-a}\left(\frac{K}{H}\right)^{\frac{\sigma-1}{\sigma}}$. *On the other hand, the asymmetric Nash bargaining model implies that the relative factor payments should be proportional to the bargaining power of each agent. That is,* $\frac{y^k}{y^h} = \frac{\tau}{1-\tau}$ *where* $0 < \tau < 1$ *is a measure of the degree of bargaining power of capital owners (and of course* $1-\tau$ *represents the bargaining power of the owners of human capital).*[13] *Then, if we combine the marginal theory of distribution and the Nash theory of distribution would lead to the following condition,*

$$\frac{a}{1-a}\left(\frac{K}{H}\right)^{\frac{\sigma-1}{\sigma}} = \frac{\tau}{1-\tau} \qquad (4)$$

Using (3) *and* (4)*, it follows that if capital markets are perfect there would be a unique equilibrium level of power that would make both theories of distribution consistent to each other,*

$$\frac{1-\tau}{\tau} = \left(\frac{a}{1-a}\right)^{-\sigma} \qquad (5)$$

However, there are no mechanisms that assure condition (5). It is not plausible to assume that bargaining power is determined merely by production parameters. ■

Thus, either bargaining power or the marginal theory of factor distribution must be irrelevant to explain factor payments and distribution. If the level of bargaining power is in fact entirely determined by the marginal factor distribution, then the bargaining model would play no role in distribution. On the other hand, if τ is determined by forces other than the marginal productivities, equation (5) would not be valid and then adopting the Nash theory of distribution would invalidate the marginal theory of factor distribution (equation (5) might be satisfied merely by chance). One may reasonably argue that the degree of bargaining power of economic agents is determined at least in part by political and institutional conditions and that there might be no reason why these politico-institutional conditions would necessarily adapt to the levels of marginal factor productivity.

[13] For algebraic simplicity we have assumed that the reservation utilities of the players are zero. Of course, consideration of non-zero reservation utilities would not affect the ensuing qualitative results.

The profound attachment of economists to the marginal theory of distribution assuming either perfect capital markets or, if market imperfections are allowed, that they are in fact exogenous, is a reason why Nash theory of distribution has been neglected as a theory of factor distribution. However, as we show below, once endogenous capital market imperfections are considered, the marginal theory and the Nash theory of distribution become compatible and, moreover, they become instrumental in jointly determining factor distribution.

Endogenous capital market distortions and economic power

Here we model two important phenomena. First, we recognize the existence of *endogenous* capital market imperfections which introduce a wedge between factor rewards and their marginal productivities. This provides space for bargaining theory to play a (partial) role on distribution in combination with *distorted* marginal products given by the capital market imperfection. Second, we introduce a role for bargaining power to be determined by both economic and political factors.

Capital markets. It has long been recognized that capital markets are subject to distortions associated mostly to imperfect and asymmetric information (Stiglitz and Weiss, 1981). One mechanism to deal with asymmetric information is often the requirement for collateral to borrow in the capital market (Bhattacharya, 1998; Piketty, 1997). The following lemma follows,

Lemma 1 (intrinsic capital market imperfection)*. Collateral debt requirements often prevailing when capital market are imperfects, discriminate in favor of agents investing in tangible assets (such as physical capital) in detriment of agents investing in intangible assets (such as human capital).*

Proof. *The key source of this result is that lenders are often unwilling to accept intangible assets as debt collateral because assets such as human capital are extremely difficult to appropriate by lenders in case of default. By contrast, secondary markets for physical assets often exist and hence they can more easily be appropriated by lenders in case of default*.■

Thus, intrinsic capital market imperfections give an advantage to individuals whose income depends primarily on investments in physical capital vis-a-vis individuals whose main asset is human capital. That is, the effective cost of credit tends to be lower for owners of physical capital than for owners of human capital. This collateral discrimination in favor of owners of physical capital is one reason why K-owners tend to constitute a small fraction of the total population.[14] On the other hand most of the population relies mainly on human capital as its key source of income.

[14] New potential investors in K are at a disadvantage vis-à-vis incumbent ones because the latter have already the capital stock that may be used as collateral while the newcomers would have to build collateral

A generalized fundamental capital market equilibrium condition. The prevalence of imperfect capital markets leads the following proposition,

Proposition 3 (on balanced growth equilibrium with capital market distortions). *If capital markets are imperfect a generalization of the fundamental balanced growth equilibrium condition for multi asset endogenous growth models is the following:*

$$F_K(K/H, 1) = gF_H(K/H, 1); \qquad g > 0, \tag{6}$$

where g is a measure of the net distortion in the capital market.

Proof. *See appendix.*

$g = 1$ implies no distortions and g<1 (g >1) indicates pro-physical capital (pro-human capital) distortions.

The net degree of distortion g is not only determined by the intrinsic imperfections of capital markets (mainly due to the collateral effect discussed earlier). In addition, political factors may also play a role in determining the degree of distortion by generating public policies which may be biased in favor of capital owners or human capital owners.[15] These political factors may thus alter the degree of market distortion, partly or completely offsetting the intrinsic capital market inefficiency (which biases the incentives in favor of physical capital owners) or even exacerbating it. If $g > 1$ means that pro-human capital political biases are powerful enough to more than offset the intrinsic bias of capital markets in favor of physical capital owners. If $g < 1$ then politico institutional factors are either insufficient to compensate for the inherent biases of capital markets or even exacerbate them. When political factors are just enough to compensate the economic collateral-related factors the capital market attains a virtuous equilibrium with g =1. In general, there is no reason *a priori* why this would happen.[16] We thus expect that at any point in time $g \neq 1$.

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capital to attain similar access to credit markets (this is especially true when K investment entails some form of "lumpiness" or fixed entry costs). This acts as a barrier to entry which confers protection to the incumbents and thus limits the number of investors in physical capital. Since all H-investors, including incumbent and potential new ones face similar restrictions in the credit markets, investing in H is more open to new often small investors. The contrast is clear; significant K-investments are relatively closed, restricted to few mostly wealthy and/or established investors, while H investments are open to new investors, all facing similar disadvantages relative to investors that are K-owners. Thus, discrimination in capital markets causes that the H-investors are many but each investing little while large K-investors are few.

[15] Pro-H public policies include free basic and secondary public education, subsidized student loans, etc. Pro-K policies may include investment subsidies, interest payment tax deductions, preferential tax rates on dividends, and so forth.

[16] Relating this to the alternating offers model, one may argue that differential access to the capital markets may affect the discount factors of K-owners and H-owners. Those that have an advantage in the access to the capital markets may exhibit lower discount rates than agents that face greater restrictions in their access

Temporary Equilibrium

We define temporary equilibrium (or conditional equilibrium) as the equilibrium levels reached by the fundamental economic variables (power distribution and income distribution, market imperfection, and economic growth) attained for *given* political conditions.

The equilibrium capital to human capital ratio. In temporary equilibrium the economic collateral effect, if not offset by politico-institutional forces, causes that in equilibrium the true marginal product of physical capital to be lower than the true marginal product of human capital ($g < 1$). Factor payments are not tied to the true marginal product of the factors but to their distorted values. That is, there is a wedge between factor rewards and their true marginal productivities. Using (6) it follows that if $g < 1$ then the distorted equilibrium physical capital to human capital ratio, $(K/H)^{\mathrm{e}}$, is greater than the optimal one, that is,

$$\left(\frac{\mathrm{K}}{\mathrm{H}}\right)^{\mathrm{e}} > \left(\frac{\mathrm{K}}{\mathrm{H}}\right)^{*} = \left(\frac{\mathrm{a}}{1-\mathrm{a}}\right)^{\sigma} \qquad (7)$$

Using (6) it follows that the distorted $(K/H)^{\mathrm{e}}$ equilibrium ratio is a decreasing function of g. Using the CES specification in (6) we obtain,

$$\left(\frac{\mathrm{K}}{\mathrm{H}}\right)^{\mathrm{e}} = \left(\frac{\mathrm{a}}{(1-\mathrm{a})g}\right)^{\sigma} \qquad (8)$$

As discussed earlier, it is possible that political conditions act against the intrinsic biases of capital markets inducing a perfect off-setting of such biases, so that g =1 causing $(K/H)^{\mathrm{e}} = (K/H)^{*}$or, alternatively, that the political conditions induce over-shooting causing g >1 in which case $(K/H)^{\mathrm{e}} < (K/H)^{*}$.

Economic Power and political conditions. We postulate that the relative bargaining power of physical capital owners is determined by both political and economic factors. Political factors depend on the government regime; a main mechanism by which the government regime affects power distribution is through the factor A; this is in turn related to policies that directly or indirectly affect the functioning of markets, in our model represented by the capital market.

Economic factors affecting power are represented by the capital-to-human capital ratio. A higher ratio implies a relative abundance of physical capital which, given A may reduce the bargaining power of physical capital owners, thus implying a negative relationship between capitalists' power(τ) and the K/H ratio. Thus, we can postulate the following specification for a simple relationship between bargaining power of capitalists and the political and economic conditions prevailing,

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to capital markets. This, in turn, implies that the bargaining power of those that face better access to markets would be higher than agents facing greater capital market restrictions.

$$\boldsymbol{\tau} = \mathrm{A(z)}\ ((K/H)^{e})^{\gamma} \qquad (9)$$

where z is a vector of political conditions, A is a function that relates to the vector z and γ is a fixed parameter. A can be interpreted as a summary measure of the degree of bias of the existing government regime in favor of capitalists. We assume that $\gamma < 0$; the K/H ratio could also exert a positive effect on bargaining power by affecting politics, but such effect is captured by A(z) in equation (9). That is, for a *given* level of political conditions, the effect of the K/H ratio on τ is expected to be negative.

Asymmetric Nash bargaining equilibrium. Nash bargaining equilibrium is obtained from a generalized form of Equation (4) using now the distorted relative factor payments. This distorted ratio should be equal to the relative bargaining power ratio, which using the CES production function obtains,

$$\frac{\mathrm{a}}{1-\mathrm{a}}((K/H)^{e})^{\frac{\sigma-1}{\sigma}} = \frac{\tau}{1-\tau} \qquad (10)$$

Solving the temporary equilibrium system. The three equations, (8) representing *equilibrium in the capital markets*, (9) representing *power-political equilibrium*, and (10) showing the *Nash bargaining-cum-marginal distribution equilibrium,* constitute a system of equations that simultaneously solves for the temporary equilibrium of the system, conditional on a given political environment. The three endogenous variables characterizing this temporary equilibrium are the equilibrium distribution level of bargaining power (τ), the capital-to-human capital equilibrium ratio ($(K/H)^{\mathrm{e}}$), and the equilibrium degree of the capital market distortion (g). This solution is *conditional on a given level of A*. The solution to equations (8) to (10) can thus be categorized as a *temporary equilibrium solution* which evolves over time as A, a function of the political equilibrium to be analyzed below, endogenously changes over the long run.

Using (8) in (9) and (10) obtains,

$$\boldsymbol{\tau} = \mathrm{A}(z)\left(\frac{a}{(1-a)}\right)^{\gamma\sigma} g^{-\gamma\sigma} \qquad (11)$$

and

$$g^{1-\sigma} = \frac{\tau}{1-\tau}\left(\frac{a}{1-a}\right)^{-\sigma} \qquad (12)$$

Thus, equations (11) and (12) simultaneously determine the equilibrium values of g and τ and then the resulting value of g recursively determines $(K/H)^{\mathrm{e}}$ via equation (8).

An integrated theory of distribution. To appreciate the importance of recognizing the endogenous nature of the capital market distortion as a factor making the Neoclassical and Nash theories of distribution compatible, contrast expression (12) to (5): Now we have that the both the degree of distortion g and the degree of market power τ adapt to each other thus allowing consistency between the two theories of distribution. Also,

factor payments are now determined by the interaction of the marginal productivity of the factor and its bargaining power. Thus, the wage rate for example (in units of H), is $w = g(\tau)F_H\left(\left(\frac{K}{H}\right)^e\right)$ and the price of capital is $r = g(\tau)F_K\left(\left(\frac{K}{H}\right)^e\right)$, where the expression $g(\tau)$ with $g'(\tau) < 0$ follows from (12), and $\left(\frac{K}{H}\right)^e$ which is also a function of τ, is defined by (8). Using (8) and (12) in the wage capital price expressions above obtains,

$$w = a^{-\frac{\sigma}{1-\sigma}}\ \tau^{-\frac{1}{\sigma-1}} \qquad\qquad r = a\left(\frac{1-a}{a}\right)^{\sigma}\left[\frac{\tau}{1-\tau} + \mathrm{a}\left(\frac{a}{1-a}\right)^{\frac{\sigma}{1-\sigma}}\left(\frac{\tau}{1-\tau}\right)^{\frac{1}{\sigma-1}}\right]^{\frac{1}{\sigma-1}}$$

That is, factor rewards are determined not only by the production technology (in this simple case represented by a) as the marginal theory of distribution predicts, but also by the degree of bargaining power of the factor. Increasing bargaining power of capitalists reduces the wage rate and increases the price of capital. Moreover, the effects of changes in productive parameters on factor prices depend on the level of bargaining power of capitalists and workers.

Economic growth. The rate of economic growth is recursively derived from the solution of the equations (8) to (10). The following proposition characterizes the rate of economic growth also as a temporary equilibrium solution.

Proposition 4 (on the rate of economic growth in distorted balance growth equilibrium).*The balanced rate of economic growth (G) may be directly and uniquely determined by the equilibrium $(K/H)^e$ ratio as obtained from the solution to equations (8) to (10). Moreover, G exhibits an inverted U-shaped relationship with $(K/H)^e$. The capital market distortion biasing the equilibrium K/H ratio not only causes static efficiency losses but also impinges upon the long run rate of economic growth. The growth rate in balanced growth equilibrium is,*

$$G = Min\,\{\beta[F_K(K/H) - \rho]; \beta[F_H(K/H) - \rho]\},$$

Where β is the inverse of the elasticity of marginal utility (which is assumed to be constant). Clearly, G achieves a maximum when g =1, which implies that $F_K\left(\left(K/_H\right)^*\right) = F_H\left(\left(K/_H\right)^*\right)$.

Proof*. See appendix.*

An important implication of Proposition 4 is that the rate of growth crucially depends on the equilibrium capital/human capital ratio. There is an inverse U-shaped relationship between the rate of growth and the equilibrium K/H ratio, with growth attaining a maximum when $(K/H)^{\mathrm{e}} = (K/H)^*$ **.**

The temporary equilibrium: A graphic illustration. Figure 1 shows the temporary equilibrium solution to the system of equations (8) to (10) for the endogenous economic variables. The upper right-hand panel shows the simultaneous determination of g and τ, which are obtained from equations (11) and (12). In the figure we have used the assumptions that $\gamma < 0$ and $\sigma > 1$. Thus the slope $\frac{\partial g}{\partial \tau}$ in equation (11) is positive and the same slope in equation (12) is negative. The upper left-hand panel shows the resulting $(K/H)^{\mathrm{e}}$ ratio associated with the equilibrium level of g.

The closed relationship between the degree of inefficiency and the concentration of power and hence of income that the model shows (the relationship between $g\ and\ \tau$) may seem somehow surprising; here is an intuitive explanation for this result. The greater is the concentration of power and hence of income in a small fraction of the population, the larger is the inefficiency effect of capital market imperfections. The more concentrated income is the greater is the dependence of most of the population on the capital market to implement their investment because it tends to save less to finance their investment. Hence the distortion of the capital market exerts a greater negative effect of the investment of the population that is affected by collateral requirements.

The relationship between G and $(K/H)^{\mathrm{e}}$ is shown in the lower left-hand panel in Figure 1, which as shown in Proposition 4 is U-shaped, attaining a maximum rate of growth when $(K/H)^{\mathrm{e}} = (K/H)^{*}$. As the figure shows, $g < 1$ (g >1) is associated with a higher (lower) level of power of capitalists of physical capital relative to the owners of human capital as well as with a higher (lower) K/H ratio and therefore with a slower rate of economic growth than in the case when $g = 1$. If the political conditions strongly favor human capital (the level of A is much lower than the one depicted in Figure 1) then g may become greater than 1, $\tau^{e} < \tau^{*}$, $(K/H)^{\mathrm{e}} < (K/H)^{*}$, and hence by Proposition 4, the rate of growth of the economy also becomes below the optimal rate.

Figure 1 shows a case where an increase in A exacerbates the capital market distortion thus worsening the equilibrium. Increases in A may reflect policy mechanisms that are favorable to K-owners thus exacerbating the inherent distortion of capital markets. Depending on the initial conditions it is possible that an increase of A may have the opposite effect, improve growth. This is the case if initially $g \geq 1$ in which case a rise in A corrects the capital market distortion by lowering the level of g.

The fact that the economy may exhibit positive growth implies that, as we discuss earlier, the equilibrium K/H ratio must be interpreted in a dynamic context. Both assets increase over time in long run equilibrium at the same rate which must also be equal to the growth rate of the economy. Thus, the maximum rate of growth occurs when the capital market is non-distorted, that is when g =1 and therefore $(K/H)^{e} = (K/H)^{*}$. If $g < 1$ (g >1) then the economy becomes over intensive (under intensive) in K vis-à-vis H and this has the

cost of reducing the growth rate of the economy in either case (see Figure A1 in the appendix).

It is important to emphasize that capital market neutrality (g=1) does not correspond to the "free" market equilibrium because the free market has an inherent bias in favor of investment in K and against H; that is, the *laissez-faire* equilibrium is not neutral and therefore it does not maximize economic growth, nor it promotes an optimal level of relative power. Effective neutrality can be made possible only via interventions associated with political conditions which could induce a value g=1 only if such interventions reach an optimal level.

The following proposition summarizes the key comparative static results arising from the temporary equilibrium.

Proposition 5 (On the comparative static of the temporary equilibrium). *Assume that initially* $g < 1$ $(g > 1)$*, then:*

(a) Power concentration in K-owners and the intensity of the capital market distortion move in the same (opposite) direction, conditions which are associated with a reduction (an increase) in the equilibrium rate of economic growth.

(b) Changes in the politico/institutional conditions in favor of K-owners (H-owners) causes a worsening (an improvement) of capital market distortions, greater (lower) inequality and slower (faster) equilibrium rate of economic growth.

Proof. *It is self-explanatory in Figure 1*.

Several comments about proposition 5 are in order. First, there is no causality in the relations described in part (a) of Proposition 5, they are merely associations and, moreover, the direction of the associations critically depend on the initial conditions. If initially the capital market distortion favors K-owners then rising power concentration in K-owners (which also means greater income inequality) is associated with a worsening of such distortion and a slowdown of the rate of economic growth. That is, increasing inequality and growth are inversely related. However, if the initial conditions are that the capital market distortion favor H-owners, greater inequality (a higher level of τ) is related to an amelioration of the capital market distortion and faster economic growth. Second, part (b) of Proposition 5 does reflect a causal relationship from political conditions to the economic temporary equilibrium variables. The direction of this causal relationship also depends on the initial conditions.

The following result is a corollary to the analysis in this section.

Corollary. *Political conditions (represented by A) completely dictate the temporary equilibrium achieved: They determine all the fundamental economic variables including the distribution of economic power, income distribution between K-owners and H-owners,*

the efficiency of capital markets, and the rate of economic growth. There is an optimal political equilibrium, and deviations from it may worsen the temporary equilibrium.

Given the vital importance of the political conditions it is essential to model their dynamics over time explicitly considering the feedback effects between A and the temporary equilibrium conditions. We next turn to the dynamics of A.

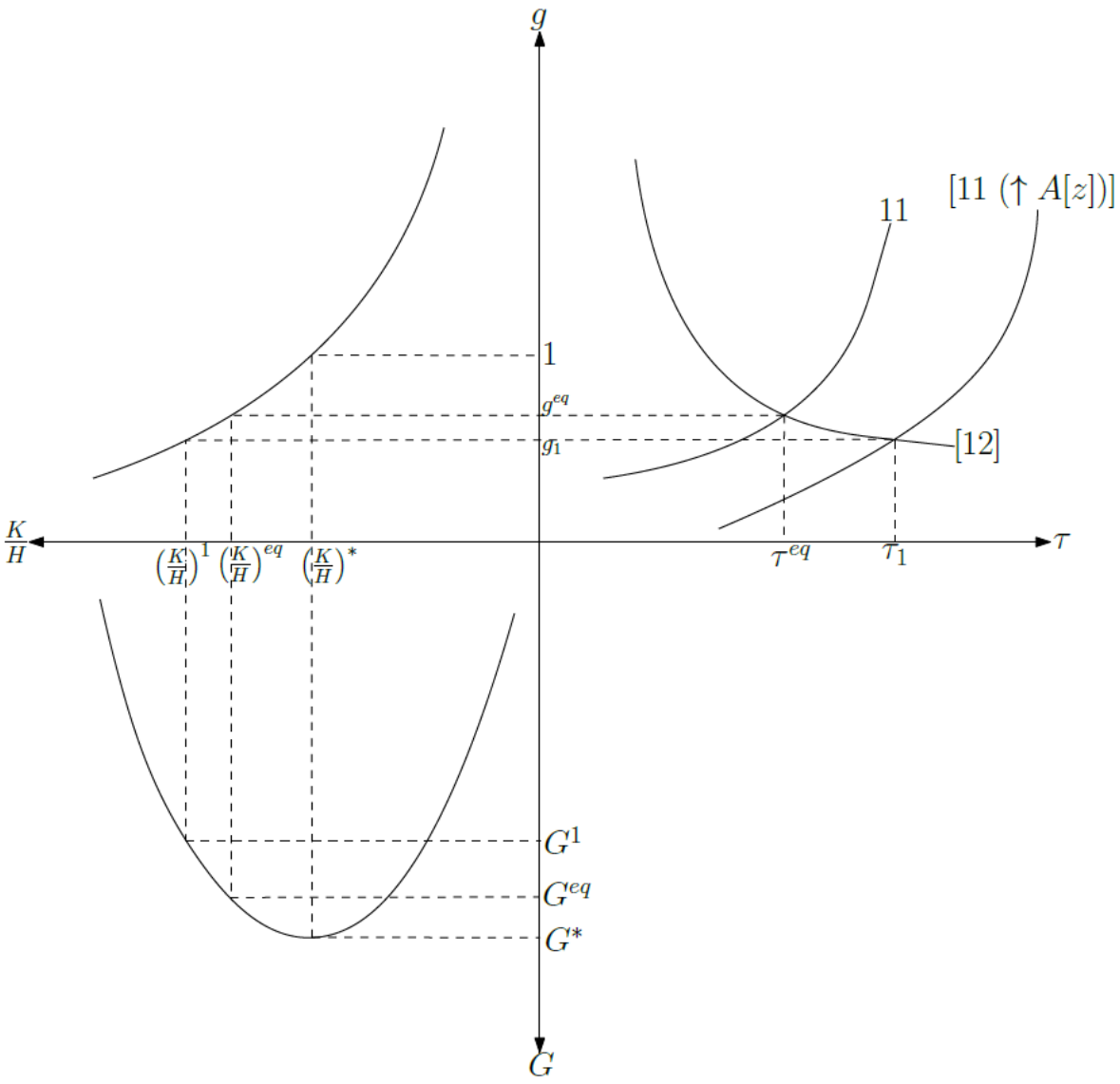

Figure 1. Temporary economic equilibrium

The dynamics of the political conditions

In this section we develop a simple model of political competition in democracy with two parties, yielding as an outcome a policy environment which in turn determines the evolution of the fundamental economic variables. The classical and most influential model of political competition is based on Downs (1957) which portrays a competition between two candidates which have no ideology and whose sole objective is to win an election. Voters do have policy preferences which are known and fixed. The two candidates are opportunistic and strive to offer a policy menu as close to such preferences as possible. Downs models political equilibrium as the Nash equilibrium of a game in which each candidate maximizes his/her chances of being elected by choosing a policy proposal. Not surprisingly, the equilibrium of such game produces what has been called the principle of "minimum differentiation" in which the policies proposed by the two candidates converge towards the median voter most preferred point in the (linear) policy space. Thus, a unique equilibrium arises, and policies remain constant as long as the voters' policy preferences do not change.

Extensions of the Downs's model have followed several channels, including removing the assumption of a linear policy space and instead allowing for a higher dimension space. Unfortunately, if the policy space is multidimensional an equilibrium may not exist (Ortuno-Ortin, 1997). An important extension is the recognition that there are parties having defined ideological preferences which propose policies according to their preferences over the space of feasible policies (Wittman, 1990; Roemer, 2001; Schultz, 1995). That is, candidates now are not merely opportunistic politicians, but represent a clear ideology and offer a defined policy proposal which may not be equal to the voters' preferred ones. However, in the absence of uncertainty these models engender similar results to the classic Downs's model (Roemer, 2001). The political parties in equilibrium will converge to offer the same policies, which is the ideal policy preferred by the median voter. To a large extent this is due to the fact that the models assuming ideological parties instead of opportunistic politicians are identical in all other respects to the model by Downs.

Below we develop a model of political competition which assumes the existence of two political parties with clear and dissimilar ideological preferences arising from their representation of the two classes that we consider here, workers and capitalists. Preferences by each party and voters are entirely defined in the space of economic variables, most importantly economic power. While preferences are defined on a unidimensional space (the distribution of economic power between workers and capitalists), the fact that, as shown in the previous sections, all other economic variables, including distribution of income, economic efficiency and economic growth change at unison to each other and with economic power, means that the choice space may be in fact regarded as multidimensional. That is, given that all the fundamental economic

variables defined earlier are interdependent and harmonious in a unique way, we may consider any one of them in determining the policy space over which political competition occurs.[17] We choose economic power given the intuitive appeal of using it as the key bridge linking economics and politics.

A distinctive feature of the model is that the characteristics of the electorate, and hence its voting patterns, endogenously change over time in response to the policies implemented by the party in office. In part for this reason, the preferences of the median voter are not known *ex ante* by the political parties. Also, to the extent that the parties are assumed to represent well-defined class interests (workers or capitalists), there is a clear recognition by the electorate of their basic policy orientation, a feature that makes it futile for the parties to hide their real policy biases for the purpose of maximizing their chances of being elected or reelected.

It turns out that these important considerations lead to some fundamental departure of our results from the standard ones. The range of strategic potential games to win an election is quite limited. As a consequence, the political equilibrium does not converge to a unique policy point as parties essentially maintain their own identity and thus keep their policy differentials. This is so despite that the endogeneity of the preferences of the electorate may imply that once a party is in power the implementation of its policy may lead to an increasing chance of being kicked out of office. The outcome is thus essentially cyclical, with the two parties alternating in power. The cyclical nature of the political outcome is transmitted to the economic outcome which causes that the sequence of temporary equilibria of the fundamental economic variables also follow a cyclical pattern.

The model used here is related to the analysis by Ortuño-Ortin (1997) who shows that if parties care about the fraction of votes that they get, equilibrium with profound policy differentiation may occur even in the absence of uncertainty. We obtain the same result but for completely different reasons. Our model is also somewhat related to Roemer (1995), which focusing on political uncertainty leading to random party turnover, predicts equilibrium with stochastic political cycles. Unlike Roemer´s analysis we predict non-stochastic political cycles which is consistent with certain empirical evidence for the USA showing that the hazard rates of defeat of incumbents rises over time leading to a more cyclical behavior than would be expected if party turnover were merely random as in Roemer´s model (Lin and Guillen, 1998).

Social Optimum. Consider first the conditions required for an "optimal" temporary equilibrium. This need g=1 which, in turn, using this value in (8), (9) and (10) implies that,

[17] Of course, there are several non-economic variables which in reality may be part of the policy space that we do not include here. However, our focus is on economic factors; we study how they impinge upon the political choice and how the political choice feedback into the determination of a new temporary equilibrium of the economic variables.

$$A^* = \frac{\left(\frac{a}{1-a}\right)^{\sigma(1-\gamma)}}{1+\left(\frac{a}{1-a}\right)^{\sigma}}; \quad \boldsymbol{\tau}^* = \frac{\left(\frac{a}{1-a}\right)^{\sigma}}{1+\left(\frac{a}{1-a}\right)^{\sigma}}; \quad \left(\frac{y^k}{y^h}\right)^* = \frac{\tau^*}{1-\tau^*} = \left(\frac{a}{1-a}\right)^{\sigma} \tag{13}$$

These conditions represent the political conditions (A^*) that would exactly compensate for the intrinsic distortions of the capital markets and hence which would allow for an optimal distribution of power and income between K-owners and H-owners. Also, as shown in the appendix, the optimal rate of economic growth can be derived considering that the non-distorted equilibrium rate of growth of consumption ($c(t)$)is,

$$G^* \equiv \frac{dlnc(t)}{dt} = \beta\left[F_K\left(\left(\frac{K}{H}\right)^*\right) - \rho\right], \tag{14}$$

Where β is the inverse of the elasticity of marginal utility of consumers.

The question is whether plausible dynamics of the politico-institutional conditions would in fact allow the system to converge, perhaps in the very long run to an optimal steady state solution as represented by (13) and (14).

Dynamics of A in democracy: Heuristics. The evolution of A is sluggish and is dependent on past temporary equilibria which, in turn, are in large part driven by past levels of A itself. Based on historical and cultural conditions, the tolerance of society for inequality (and hence for high levels of A and τ) is given at any point in time. We postulate that there exist three groups. Two of these groups (which we call groups E and P) are small and constitute mainly ideological political parties, representing the interests of the capitalist elites and workers, respectively. A third group, which we denote by N and constitute most of the population which decide the elections. The parties try to persuade N in favor of political options closer to their respective ideological inclinations. Members of the group N vote mostly driven by the self-interest of its members.

Specifically we have: (i) Party E ("conservatives"), whose main concern is to maximize the benefits of economic growth accruing to K-owners; (ii) Party P ("progressives") which tries to maximize the benefits of economic growth accruing to H-owners; (iii) Group N ("neutrals") which have no clear ideological preferences and are highly heterogeneous comprised of people deriving their income from a variety of sources including human capital, physical capital and combinations of them in different proportions. Because of its heterogeneity, the median voter in this group constantly adjust their political inclinations and, depending on the prevailing economic conditions, may gradually be more inclined to vote for either E or P. For example, slow economic growth with low levels of inequality are conditions favorable for party E to influence N more effectively.

Consider for example an economy that has been managed by Party P for some time, causing $A_{t-1} < A^*$. This means that the temporary equilibrium achieved at time t (which, as shown in the previous section, depends on A_{t-1}) is inefficient characterized by slow growth ($G_t < G^*$), significant market inefficiency ($g_t > 1$), relatively low concentration of

power in the capitalist class ($\boldsymbol{\tau} < \boldsymbol{\tau}^*$), and consequently a level of inequality below its optimal level ($\left(\frac{y^k}{y^h}\right)_t < \left(\frac{y^k}{y^h}\right)^*$). As we show below, depending on dynamic properties of A, it is possible that despite this economic inefficiency the P-government remain in power for some time and that the level of A may continue to fall further, thus exacerbating the economic inefficiencies originally caused by their policies. However, as the economic costs of inefficiency increase over time there may exist a turning point inducing A to reverse its dynamics. This happens when the tolerance for inefficiency and slow growth by the voters become exhausted, making most of them to vote influenced by E. This causes a change of the government regime towards one that is ruled by E.

A new cycle increasing A and thus reducing inefficiencies, gradually recovering the rate of economic growth and increasing income inequality, begins. At first, starting from low levels of inequality, the increasing inequality that the new policies bring about are well tolerated while the revival of growth is highly appealing to the majority of the population. The success of these new policies causes more people to support further increases of A over time in the form of policies that reduce social subsidies, deregulate the business sectors, and so forth. Meanwhile, the economic power of capitalists grows. This process may continue over time, at first causing a consequent improvement in efficiency and growth but there are no assurances that the increases of A will stop at A*. The dynamics of political conditions may overshoot and pass well below such optimal level, thus gradually inducing other types of inefficiency which cause the higher rates of economic growth so far achieved to become increasingly difficult to sustain. Power becomes increasingly concentrated in the capitalists, growth and efficiency eventually falls and inequality continuously rises beyond the optimal levels of inequality. But this process eventually induces party P to gradually become more influential among voters. In the end this overshooting process continues until the P forces become powerful enough to defeat the shrinking E political forces. At this point a new policy environment arises and the cycle of A is reverted again possibly leading to overshooting causing a new cycle.

From the previous analysis it follows that the dynamics of A (and hence of the full economic system) may exhibit a cyclical process. The cycles may be in general permanent and there is no reason to necessarily expect convergence to a socially optimum politico-institutional. [18]

[18] This is consistent with the view of recent literature arguing that political institutions do not necessarily converge to efficient institutions (see, for example, Acemoglu, 2002, Bardhan, 2001, or Busch and Muthoo, 2003).

The nature of the political cycles: A formal analysis

The boundaries of the cycles are in part determined by the behavior of parties E and P. These parties are homogenous and fully committed to either ideology. While the two parties have diametrically opposite concerns for equity, both share a concern for economic growth, albeit to a different extent. The difference lies in the weights that each group attaches to equity versus growth.

Note that τ and A are uniquely related to each other. In fact, using equations (11) and (12) it can be shown that the equilibrium level of τ is an increasing function of A. This means that we can analyze the dynamics of the system by focusing indistinctly on either A or τ. We choose to use economic power given the intuitive appeal of using it as the key bridge linking economics and politics.

Party E. We assume that E aspires to maximize the benefits of economic growth accruing to K-owners.[19] Thus, it aspires to a level of τ which would,

$$\underset{\tau^E}{\text{Max}}\, \tau^E\, G(\tau^E) \qquad (15)$$

$$subjet\ to\quad 0 \leq \tau^E \leq 1\ and\ G(\tau^E) > 0$$

The optimal conditions for this problem are,

$$G(\tau^E) + \tau^E \frac{\partial G(\tau^E)}{\partial \tau^E} = 0 \qquad (16)$$

And second order condition,

$$\tau^E \frac{\partial^2 G(\tau^E)}{\partial \tau^{E2}} + 2\frac{\partial G(\tau^E)}{\partial \tau^E} < 0 \qquad (17)$$

Where τ^E is the *desired* level of τ by party E. These conditions allow us to show the following lemma.

Lemma 2*. The desired level of capitalist power by party E is in the downward segment of the growth function.*

Proof. *By constraint (15)* $G(\tau^E) > 0$, *which using (16) implies that at the optimum chosen by E the slope of the growth function must be negative,* $\frac{\partial G(\tau^E)}{\partial \tau^E} < 0$. *This plus the required concavity of the growth function implies that the second order condition for a maximum is also satisfied.* ■

[19] Alternatively, one may postulate that the objective function of E is to maximize the participation of K-owners in total production instead of economic growth. A justification for not doing this is that the output level at a point in time can be seen as already given and that it might be difficult to change its appropriation by the asset owners. By contrast, the benefits of the forthcoming economic growth are more open to be appropriated.

It must be emphasized that party E cannot affect the actual level of τ and that τ^E is merely an objective proposed by E to the rest of society, which could be partially materialize only if Party E win the election.

Party P. As indicated earlier P seeks to maximize the benefits of economic growth accruing to the H-owners. Thus, this party aspires to a level τ^P which would,

$$\underset{\tau^P}{\text{Max}}(1-\tau^P)G(\tau^P) \tag{18}$$

$$subjet\ to\ \ 0 \leq \tau^P \leq 1\ and\ G(\tau^P) > 0$$

The optimal condition for this problem is,

$$-G(\tau^P) + (1-\tau^P)\frac{\partial G(\tau^P)}{\partial \tau^P} = 0 \tag{19}$$

And second order condition,

$$\left(1-\tau^P\frac{\partial^2 G(\tau^P)}{\partial \tau^2}\right) - 2\frac{\partial G(\tau^P)}{\partial \tau} < 0 \tag{20}$$

These conditions lead to lemma 3.

Lemma 3. *The desired level of capitalist power by party P (τ^P) is low enough to be in the upward segment of the growth function.*

Proof. *Follows directly from constraint (18) and condition (19). That is, $\frac{\partial G(\tau^P)}{\partial \tau^P} > 0$ which in turn implies that the second order condition for a maximum, (20), must be satisfied given concavity of the growth function.* ■

Note that the maximization conditions for both parties rule out the socially optimum level of τ which occurs when $\frac{\partial G(\tau)}{\partial \tau} = 0$. Thus, the socially optimum level of τ and hence of A always lies between the extremes of the levels of τ desired by each party. The two levels of τ proposed by parties E and P can be regarded as the extreme values that τ can attain.

Group N. Individuals in group N vote according to their perceived economic interests. Group N is highly heterogeneous, comprising individuals whose income depends only on H, others on H and K to different extents and still others, the smallest number, whose income is completely dependent on K. The median income is the income of the median voter, which must reflect this heterogeneity of income sources. If the median voter has preferences closer to those proposed by E (P) then a government E (P) is elected.

Assumption A. *While the income of the median voter does reflect the heterogeneity of the income sources of voters, we assume that his/her income is comprised in more than 50% of human capital sources.*

This assumption simply reflects the fact that most of the population derives its income from human capital sources, "pure" capitalists are a small fraction of the population.

We postulate that the desired level of τ by the median voter (τ^N) is determined to maximize the participation of group N in the benefits of economic growth, where its objective function accounts for a factor related to the heterogeneity of group N. We make a sharp distinction between the desired level of power distribution by the median voter (τ^N) and the actual level of power distribution (τ).

The median voter maximizes his/her participation in economic growth,

$$\underset{\tau^N}{\text{Max}}(1-\tau^N)^{\theta(\tau)}G(\tau^N) \qquad (21)$$

$$subjet\ to\ \ 0 \leq \tau^N \leq 1; G(\tau^N) > 0\ and\ 0 \leq \theta(\tau) \leq 1$$

Where $\theta(\tau)$ is a factor that captures the diversity of group N, which makes the median voter to represent not only H-owners but also all the subgroups described above including those whose income depends on both assets and a few "pure" K-owners; θ=1 would imply that N is fully homogenous comprised only of H-owners and their preferred choice would coincide with P. In general, however, since this group also includes people whose income at least in part also depends of capital income, the median voter must also partially consider the interest of the owners of physical capital. This causes θ to be generally less than 1.

We postulate that θ is an increasing function of the level of the actual or prevailing level of capitalist power (τ) because as τ rises the distribution of income becomes more concentrated in the K-owners which are a minority in group N. An increase of τ would have a negative effect on those members of N whose income depends to a lesser extent on K. By assumption A the income of the median voter must fall and hence the median voter must become more aligned to the interests of workers. This causes θ to be an increasing function of τ, $\frac{\partial\theta(\tau)}{\partial\tau} > 0$.

The first order condition of problem (21) is,

$$(1-\tau^N)\frac{\partial G(\tau^N)}{\partial\tau^N} = \theta G(\tau^N) \qquad (22)$$

We note that if $\theta = 1$ then $\tau^N = \tau^P$. From (22) and the second order condition for a maximum, it follows that $\frac{\partial\tau^N}{\partial\theta(\tau)} < 0$. Also, since $\frac{\partial\theta(\tau)}{\partial\tau} > 0$ we have that,

$$\frac{\partial\tau^N}{\partial\tau} = \frac{\partial\tau^N}{\partial\theta(\tau)}\frac{\partial\theta(\tau)}{\partial\tau} < 0. \qquad (23)$$

That is, a rise in the level of τ causes an increase of θ which in turn induces a lower level of τ^N.

Assumption M (gradual policy adjustment). *Regardless of the party in power, the adjustment of the actual level of τ is gradual.*

A justification for assumption M is that changes in τ are complex and take time. The change of τ is the resultant of adjusting a large number of institutional and policy variables that take time to implement. If for example party E reaches power, adjusting τ may involve deregulation, changing labor laws to make them more pro-business, cutting social subsidies, tax cuts to capital income, and so forth that take time to be implemented. Similarly, when P access to power, dismantling many of the existing policies may take time and hence the policy adjustment will necessarily be gradual. Additionally, if a new government regime would instantaneously bring τ to its desired level (τ^E or τ^P) it would risk being booted out of office very quickly and the policy would be reversed. So, apart from the fact that policy reforms take time to be implemented, parties themselves may be reluctant to adjust their policies too quickly, especially because they may not be sure about how the median voter preferences change in response to their own policies.

The following lemma follows directly from conditions (16), (19) and (22) and assumption M:

Lemma 4*. The desired levels of τ of the three groups considered can be ranked as follows:*

$$\tau^E > \tau^N \geq \tau^P$$

The desired levels τ^N and τ^P are on the increasing segment of the growth function while τ^E is on the decreasing side of the growth function. More*over,*

$$\text{if } \dot{\tau} > 0 \rightarrow \quad |\tau - \dot{\tau}^N| > 0 \text{ and if } \dot{\tau} < 0 \rightarrow |\tau - \dot{\tau}^N| < 0.$$

Proof. *The first part of the lemma 4 follows directly from lemmas 2 and 3. The last part is self-evident when using (23) and assumption G.* ■

Elections and the government regimes. There are only two possible government regimes, E or P. If E is in power, then $\dot{\tau} > 0$ provided that $\tau < \tau^E$ (which is always true because τ^E is the maximum level of τ). If P is in power, then $\dot{\tau} < 0$ (which is always true because τ^P is the minimum level of τ).

The following lemma describes the government regime chosen.

Lemma 5*. Assume that the median voter votes for the political group represented by either E or P, which is closest to her/his preference for τ, then we have the following election outcomes:*

(a) E is elected if $|\tau^E - \tau^N| < |\tau^P - \tau^N|$
(b) P is elected if $|\tau^E - \tau^N| > |\tau^P - \tau^N|$
(c) If $|\tau^E - \tau^N| = |\tau^P - \tau^N|$ then the incumbent government remains in power.

Proof. *Follows directly from the assumption that the median voter prefers the political party that is closest to her/his preferences.* ■

Thus, $\dot{\tau} > 0$ if E is in power and $\dot{\tau} < 0$ if P is in power. If E is in power and the level of τ has already surpassed the level of τ^*, we have that G is suboptimal and declining. Then by lemma 4 $|\tau^E - \tau^N|$ must be increasing and $|\tau^P - \tau^N|$ decreasing. Hence, the probability that E will lose power as time goes on increases. Similarly, if P is in power $\dot{\tau} < 0$, and if $\tau < \tau^*$ then $|\tau^P - \tau^N|$ increases and $|\tau^E - \tau^N|$falls over time. This implies that regime P eventually loses power.

Assumption Z. *Parties may not play Nash.*

A common assumption in the political equilibrium literature is that parties play Nash in their policy proposals and thus a fixed equilibrium without cycles attain. We argue that in the context of the present model this is not plausible except under the especial conditions described in lemma 6 below. Playing a Nash game implies that parties lose their identities which may not be appreciated by their members. The reason to exist of the parties is to defend the interest of either capitalists or workers. If they yield on their principles they really lose their reason to exist and they would become liable to be displaced by new parties[20]. Moreover, in our framework the preference of the median voter is not fixed as in most conventional analyses but rather is a moving target for the parties, which is constantly changing with the very policies being implemented. This makes it difficult for the parties to understand the actual benefits to be obtained by relaxing their proposals, which is of course a necessary condition for the Nash game.[21]

Proposition 6 (on the cyclical dynamics of power and political cycles). I*f lemmas 2 to 5 are valid and if Assumption Z holds the political process follows a permanent cyclical dynamics which in turn implies that progressive and conservative governments will alternate in power. Economic growth, inequality and economic inefficiency will also follow a cyclical patterns. Only if τ^N is constant this conclusion would not attain.*

Proof*. F*ollows directly from lemmas 2 to 5.

Figure 2 illustrates the dynamics of power in the upper right hand panel and the associated dynamics of economic growth in the lower panel. At time zero we assume that E is in power and its policy is already suboptimal ($\tau > \tau^*$) which also implies that $A > A^*$ (see the left-hand side panel in Figure 2 which shows the unique relationship between A and τ). If Condition (a) in the Lemma 5 still prevails the government E can nonetheless remain in power. Hence, τ may continue rising even if the rate of economic growth at that time is declining (see the lower panel of the figure). However, as this

[20] A recent paper by Yilmaz (2012) argues that the recent resurgence of far right political parties is in part due to the discontent with the political establishment, especially the perceived weakness of traditional right wing parties in dealing with issues such as immigration in Europe.

[21] When parties have a well-known ideology and an established reputation regarding their policy orientation, adjusting their policy proposals merely to maximize their likelihood of being elected may not be a good option. Changing their proposals approaching those of the other party in many cases would not be a credible strategy and could even backfire.

process continues a turning point is reached at time T1 in the figure where Condition (a) no longer holds and Condition (b) from lemma 5 dominates instead. At time T1 a change of government regime occurs and τ starts declining consistent with the preferences of group P. This brings about at first not only less inequality but also faster economic growth. The P government is thus confirmed in power. However, as this process continues, at time T2 the economy reaches its maximum rate of growth. Since τ continues to decline, economic growth falters. Discontent among voters grows until at time T3 there is a change in power to regime E as condition (a) dominates again. At T4 a new political and economic cycle begins.

Figure 2 shows quite clearly our assertion at the outset of this paper: Political cycles and economic cycles are indeed mirror images of each other.

There is one case where this cyclical pattern would not attain. If τ^N were fixed unaffected by the distributional condition of the economy. The following lemma shows that in this case the political system converges to an equilibrium level τ^N and to a government regime that has preferences for inequality closest to τ^N.

Lemma 6*. Assume that τ^N is constant unaffected by the prevailing level of inequality (that is, $\frac{\partial \tau^N}{\partial \tau} = 0$), then the actual level of inequality converges to τ^N and to a government regime that has the level of desired inequality which is closest to τ^N. If parties play Nash, both parties would in equilibrium offer τ^N, which means that each party would reach power with probability ½. There are no political cycles.*

Proof*. Follows directly from lemma 5.*

The desired level of inequality by the median voter is unaffected by the prevailing level of inequality if the heterogeneity factor θ is constant. In this case τ^N is constant which facilitates parties knowing the exact preferences of the median voter. The political dynamics must be such that the level of inequality must in the long run converge to the fixed level of τ^N. In this case parties play Nash and in equilibrium their policy proposals must converge because the party that does not yield their policy preferences would be condemned to be always out of power. By accepting to move towards τ^N at least they have a chance to be elected. Parties may alternate in power but changes in the party in office does not matter. Thus in this special case we are back to the classical model pioneered by Downs: Parties ideologies do not matter, only the preferences of the median voter matter.

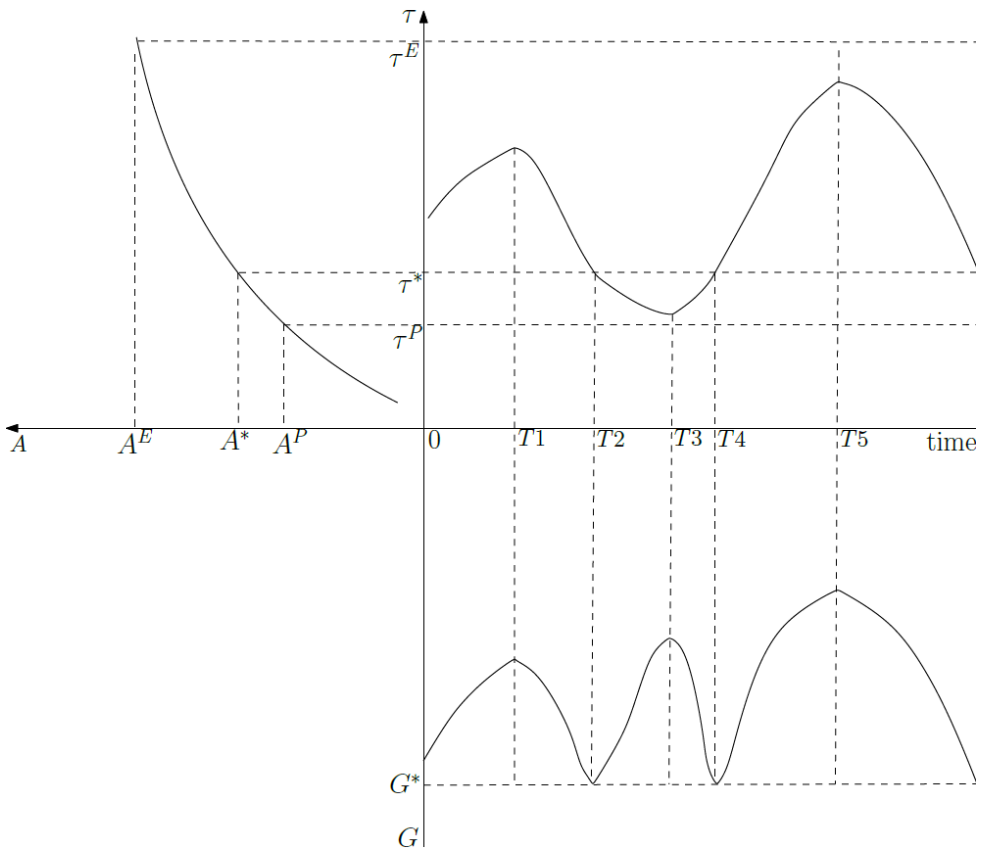

Figure 2. The cyclical dynamics of politics and economics

The political cycles studied here concern very long periods of time. Completing a full cycle probably takes much longer than the time it takes to reach temporary equilibrium for the fundamental economic variables. Relating these results to the empirical literature on political cycles, a study by Merrill et.al. (2010) concludes that in the UK the length of a full political cycle takes about 28 years, an estimate very similar to the 30-year cycles estimated for the USA by several studies (e.g., Lin and Guillen, 1998). That is, according to these studies the length of the period T1 to T5 in Figure 2 is about 30 years.

In summary, the political model presented here predicts continuous political cycles over time which are originated in endogenous changes of the voters' preferences. This model can be regarded as a formalization of the thesis developed by Arthur Schlesinger who explained the fluctuations in politics throughout American history. He contends that the political cycles are "self-generating and autonomous" (Schlesinger, 1999). Shifts in the national mood arise when discontent with present conditions drives Americans to pursue a new trend that promises to satisfy the interest of the voters. This inextinguishable discontent, according to Schlesinger, drives the cycles of change in national politics. Our model is supportive of these ideas but the "inextinguishable discontent" of the voters that leads to political change has an objective origin in the economic decline that an

excessively long permanence of a party in power brings about. The shift in the national mood may not merely be originated in the capricious feelings of the voters.

Model predictions

The model provides some important empirically verifiable predictions:

1. *Changes in government regimes entail a temporary acceleration of economic growth.* As shown in Figure 2 the access of a party to office occurs when growth has deteriorated sufficiently, a trend that is temporarily reversed when there is a change in the party in office.

2. *Time structure of growth and inequality.* Inequality continuously declines during the government of the progressive party while it continuously increases when the conservative party is in office. However in governments of both parties the rate of economic growth exhibits a humpy shape, increasing in the early part of the respective periods, and then gradually declining. This is an important and unique prediction arising from the model presented in this paper which distinguishes it from most other models.

3. *Growth rates tend to vary quite significantly over the political cycle.* The cyclical nature of the political conditions imply that high growth rates may not be sustained over time, growth spurs tend to be followed by growth declines. Similarly, periods of improving levels of equality tend to be followed by periods of increasing inequality.

4. *Political polarization and economic growth patterns*. As shown in Figure 2, the amplitude of the political cycle depends in part on the depth of the ideological party polarization (represented by the $\tau_E - \tau_P$ gap). Ideological polarization, affects both the stability of the policies and the average rate of growth over time. Lower ideological divergence between the parties and hence a lower amplitude of the political cycles imply that over time on average the policies are closer to the socially optimal ones and hence growth is nearer its maximum rate. At any point in time A_t is on average closer to A^*which implies that on average the rate of growth over time tends to be higher when political polarization is low. That is, there is an inverse relationship between political polarization and average growth rate over long periods of time.

5. Systematic alternation in power of the two political parties. While conventional models of political competition also predicts alternation in power, this process is mostly aleatory because they assume that parties converge in their policy proposals and hence their chances of being elected is 50% (this is also true of course for models that allow for uncertainty).[22] By contrast, our model predicts that parties in power gradually reduce their support over time, increasingly becoming more prone to lose the support of voters,

[22] A notable exception is Roemer (1995), who developed a model where voter preferences for current policies change adversely as a function of the length of time the incumbent party has been in power and the depth of the policy being implemented by the incumbent party.

eventually being replaced by the opposing party. That is, the party alternation in power is not merely a stochastic phenomenon but rather a systematic process over time.

Conclusion

This paper has integrated four strands of the economic development literature, the endogenous growth theory, the marginal distribution theory, the Nash distribution theory, and the market failure literature. We have shown that all the fundamental economic variables, growth, distribution and economic efficiency, are to a large degree dependent on political conditions which dictate the most important economic policies. But that political conditions are in part also dependent of economic conditions. We have shown that the distribution of power is the key bridge between the politico-institutional conditions and the economic conditions. Ignoring economic power makes it very difficult to establish a satisfactory integration of economics and politics.

We have shown that while temporary equilibria for the fundamental economic variables exist, the long run performance of the economy is likely to be cyclical because of the cyclical behavior of the political conditions, and the behavior of political variables is cyclical because economic variables are cyclical. To an extent political cycles and economic cycles are mirror images of each other.

Only under especial conditions the economy may exhibit non-cyclical behavior and converge towards a unique and stable long run equilibrium. This suggest that theories predicting "secular" trends of the capitalist economies towards stagnation and rising inequality as the famous Piketty (2014) book does, may not be plausible. Periods of stagnation, even very long ones, may be followed by periods of expansion and periods of great inequality are likely to politically backfire leading to periods of increasing equality. Similarly, theories predicting fixed economic equilibrium arising from canonical growth models may also be unsatisfactory because they assume that the political conditions are fixed or that they change only in an exogenous manner. Paradoxically, these two extremely opposed stories share the same problem, their omission of economic power. This omission leads them to fail developing a rigorous link between economic temporary equilibrium and political equilibrium.

Another important finding of this study is that the neglect of asymmetric Nash bargaining as a theory of distribution is unjustified. We showed that allowing for endogenous market imperfections, the Nash and the marginal theories of distribution are not only compatible but highly complementary in jointly determining distribution. Also, we show the closed connection between distribution and economic growth. Since these variables are endogenous their connections among each other are in general ambiguous and, therefore, trying to ascertain relationships between them without reference to the underlying power and politico-institutional conditions may be futile and misleading.

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Appendix

A simple model of endogenous growth with capital market distortions

To highlight the key issues considered in this paper and to minimize unnecessary mathematical complexities we focus on a generalization a simple two-asset model of endogenous growth due to Barro and Sala-I-Martin (2004); the model considered here generalizes the Barro and Sala-I-Martin model allowing for the existence of distortions in the capital market.

We assume that the economy maximizes the present value of consumption subject to a budget constraint and the two asset dynamic conditions. Both factors of production may change over time as the economy invest in them. We assume that these assets have an equal rate of depreciation which could be zero. We first solve a problem of optimal investment assuming no capital market distortions and next we study how the solution changes when such distortions do exist.

1. The case of no distortions

The investment chosen maximizes the present value of utility discounted at an exogenously and constant rate of time preference. Thus, the current value Hamiltonian of this problem is maximized at each point in time,

$$\max_{c(t),I(t)_k,I(t)_h} u(c(t)) - \Omega(t)\left[c(t) + I(t)_k + I(t)_h - F\left(K(t), H(t)\right)\right] + \lambda(t)I(t)_k + \eta(t)I(t)_h \qquad \text{(A1)}$$

Subject to

$$\text{(ii)} \quad \frac{dK}{dt} = I(t)_k; \qquad K(0) = K_0$$

$$\text{(iii)} \quad \frac{dH}{dt} = I(t)_H; \qquad H(0) = H_0$$

Where $I(t)_k$ is the level of investment in K, $I(t)_h$ is investment in H, $\lambda(t)$ and $\eta(t)$ are the co-state variables or shadow prices of K and H, respectively and $\Omega(t)$ is the Lagrangean multiplier of the budget constraint.

The optimal conditions are,

$$\frac{du(c(t))}{dc} = \Omega(t) \qquad A(2)$$

$$\Omega(t) - \lambda(t) \leq 0, \quad \big(\Omega(t) - \lambda(t)\big)I(t)_k = 0, \quad I(t)_k \geq 0 \qquad \text{(A3)}$$

$$\Omega(t) - \eta(t) \leq 0, \quad (\Omega(t) - \eta(t))I(t)_h = 0, \quad I(t)_h \geq 0 \qquad \text{(A4)}$$

$$\frac{d\lambda}{dt} = \rho\lambda(t) - \Omega(t)F_K\left(\frac{K}{H}\right) \qquad (A5)$$

$$\frac{d\eta}{dt} = \rho\eta(t) - \Omega(t)F_H\left(\frac{K}{H}\right) \qquad (A6)$$

Where ρ is the pure time discount rate and $F_K\left(\frac{K}{H}\right)$ and $F_H\left(\frac{K}{H}\right)$ are the net marginal products of K and H, respectively.

Consider any arbitrary K/H ratio; if at that ratio $F_K\left(\frac{K}{H}\right) > F_H\left(\frac{K}{H}\right)$ then $I(t)_k > 0$ and $I(t)_h = 0$ because condition (A3) is binding while (A4) is not. The economy only invests in asset K, $\Omega(t) = \lambda(t)$, and hence as K becomes more abundant $\frac{d\lambda}{dt} = \frac{d\Omega(t)}{dt} < 0$ and $\frac{d\eta}{dt} > 0$. Then the K/H ratio is increasing which causes the gap between the marginal products of the two factors to fall over time. Exactly the opposite occurs if at the K/H ratio $F_K\left(\frac{K}{H}\right) < F_H\left(\frac{K}{H}\right)$ in which case the economy would only invest in asset H which would cause the gap between the marginal products of the two assets to also decline.

Proof of proposition 1 (on balanced growth equilibrium with perfect capital markets). *If the economy invests in both assets we have that, $\lambda = \eta = \Omega$, which implies that $\frac{d\lambda}{dt} = \frac{d\eta}{dt} = \frac{d\Omega(t)}{dt}$. Using this in (A5) and (A6) we obtain that the economy converges to a point where,*

$$F_k\left(\frac{K}{H}\right) = F_h\left(\frac{K}{H}\right). \qquad (A7)$$

We design the asset ratio at which this condition occurs by $\left(\frac{K}{H}\right)^*$. At this point $\frac{d\lambda}{dt} = \frac{d\Omega(t)}{dt} < 0$ and $\frac{d\eta}{dt} = \frac{d\Omega(t)}{dt} < 0$; that is, since Ω(t) falls asymptotically towards zero as the two assets increase, both asset shadow prices also decline asymptotically towards zero at the same rate as Ω(t). Therefore, the economy may grow at a balanced rate with the two assets growing at the same rate, thus preserving the equilibrium $\left(\frac{K}{H}\right)^*$ ratio and output $F(K, H)$ expands at the same rate as each asset.

The optimal or balanced growth rate of consumption in equilibrium can be obtained by totally differentiating (A2) with respect to time and then using either A(5) or A(6),

$$\frac{dlnc(t)}{dt} = \beta\left[F_K(\left(\frac{K}{H}\right)^*) - \rho\right] \qquad A(8)$$

Where $\beta \equiv -\frac{1}{\partial lnu/\partial lnc}$ *is the inverse of the elasticity of marginal utility, which is assumed constant. Thus, we have that the optimal rate of growth of the economy is positive and constant in equilibrium if* $F_K\left(\left(\frac{K}{H}\right)^*\right) = F_H\left(\left(\frac{K}{H}\right)^*\right) > \rho$. ■

Thus, the optimal rate of growth of output is entirely a function of $\left(\frac{K}{H}\right)^*$ and of the pure time discount rate. Using the CES production function as presented in the main text the optimal rate of growth from (A8) is,

$$G^* = \beta\left[(a + a^{1-\sigma}(1-a)^{\sigma})^{\frac{1}{\sigma-1}} - \rho\right] \qquad \text{(A9)}$$

2. Growth with Capital market distortions.

Assume now that the cost of capital is distorted by a factor $\neq 1$. That is, the cost of borrowing to invest in K is different from the cost to invest in H. Then we can reformulate the current value Hamiltonian as follows,

$$\max_{c(t),I(t)_k,I(t)_h} u(c(t)) - \Omega(t)\big[c(t) + gI(t)_k + I(t)_h - F\big(K(t),H(t)\big)\big] + \lambda(t)I(t)_k + \eta(t)I(t)_h \qquad \text{(A10)}$$

Where the only difference between the functions (A1) and (A10) is the fact that the capital market distortion affects the relative price of the two investment goods by the factor $g \neq 1$. Of course the constraints in problem (A1) remain unchanged.

The first order conditions (A3) are now slightly different,

$$-\Omega(t)g + \lambda(t) \leq 0, \quad \big(-\Omega(t)g + \lambda(t)\big)I(t)_k = 0, \quad I(t)_k \geq 0 \qquad \text{(A11)}$$

$$-\Omega(t) + \eta(t) \leq 0, \quad (-\Omega(t) + \eta(t))I(t)_h = 0, \quad I(t)_h \geq 0 \qquad \text{(A12)}$$

Proof of Proposition 3 (on balanced growth equilibrium with capital market distortions) *While conditions (A4) and (A5) remain the same, in balanced growth equilibrium the economy invests in both assets if,*

$$\eta = \Omega\,, \qquad \lambda = \Omega g\,. \qquad \textit{(A13)}$$

Also, assuming a constant level of the degree of distortion we have that the condition,

$$\frac{d\lambda}{dt} = \frac{d\eta}{dt} = \frac{d\Omega(t)}{dt} \qquad \textit{(A14)}$$

Is still valid. Hence using (A5), (A6), (A13) and (A14) we have that generalized equilibrium condition,

$$F_K(K/H) = gF_H(K/H) \qquad \textit{(A15)}\ \blacksquare$$

Thus, if g< 1 ($g > 1$) it implies that the cost of human capital is magnified (reduced) relatively to the cost of physical capital because of the distortion. As a consequence of such capital market distortion (which is the net of the intrinsic market distortion and the distortion due to government intervention) we have that $F_K(K/H) < F_H(K/H)$ $[F_K(K/H) > F_H(K/H)]$. Only if g$= 1$ we have that the equilibrium is undistorted and $F_K(K/H) = F_H(K/H)$.

Proof of Proposition 4 (on the rate of economic growth in distorted balance growth equilibrium). *The equilibrium rate of growth is determined by two alternative regimes. If $g < 1$ then the rate of growth is given by the marginal product of physical capital, $F_K(K/H)$, but if $g > 1$ then the rate of growth of the economy is dictated by the marginal product of human capital, $F_H(K/H)$. Only in the special case where $g = 1$ the rate of growth is determined by a single regime depending of either $F_K(K/H)$ or $F_H(K/H)$ which in such case would turn out to be identical. Thus, we have*

$$G \equiv \frac{dlnc(t)}{dt} = Min\ \{\beta[F_K(K/H) - \rho]; \beta[F_H(K/H) - \rho]\} \qquad \textit{(A16)}$$

Also, the maximum rate of growth (G^*) occurs when $g = 1$ and hence, $F_K((K/H)^*) = F_H((K/H)^*)$. Clearly the relationship between G and K/H is an inverted U-shaped function reaching a maximum at K/H^*. ■

Figure (A1) below illustrates this proposition. The top panel of the figure shows the case when g<1. In this case,

$$G = \beta[F_K((K/H)^e) - \rho] = \beta(D - M). \qquad \text{(A17)}$$

The growth rate of the economy in this case is clearly less than the optimal growth rate, which in the figure is represented by

$$G^* = \beta[F_H((K/H)^*) - \rho] = \beta[F_K((K/H)^*) - \rho] = \beta(A - B). \qquad \text{(A18)}$$

The lower panel of the figure shows the case when g>1, in which case

$$G = \beta[F_H((K/H)^{ee}) - \rho] = \beta(Q - H), \qquad \text{(A19)}$$

Which is also less than G^* as shown in A(18).

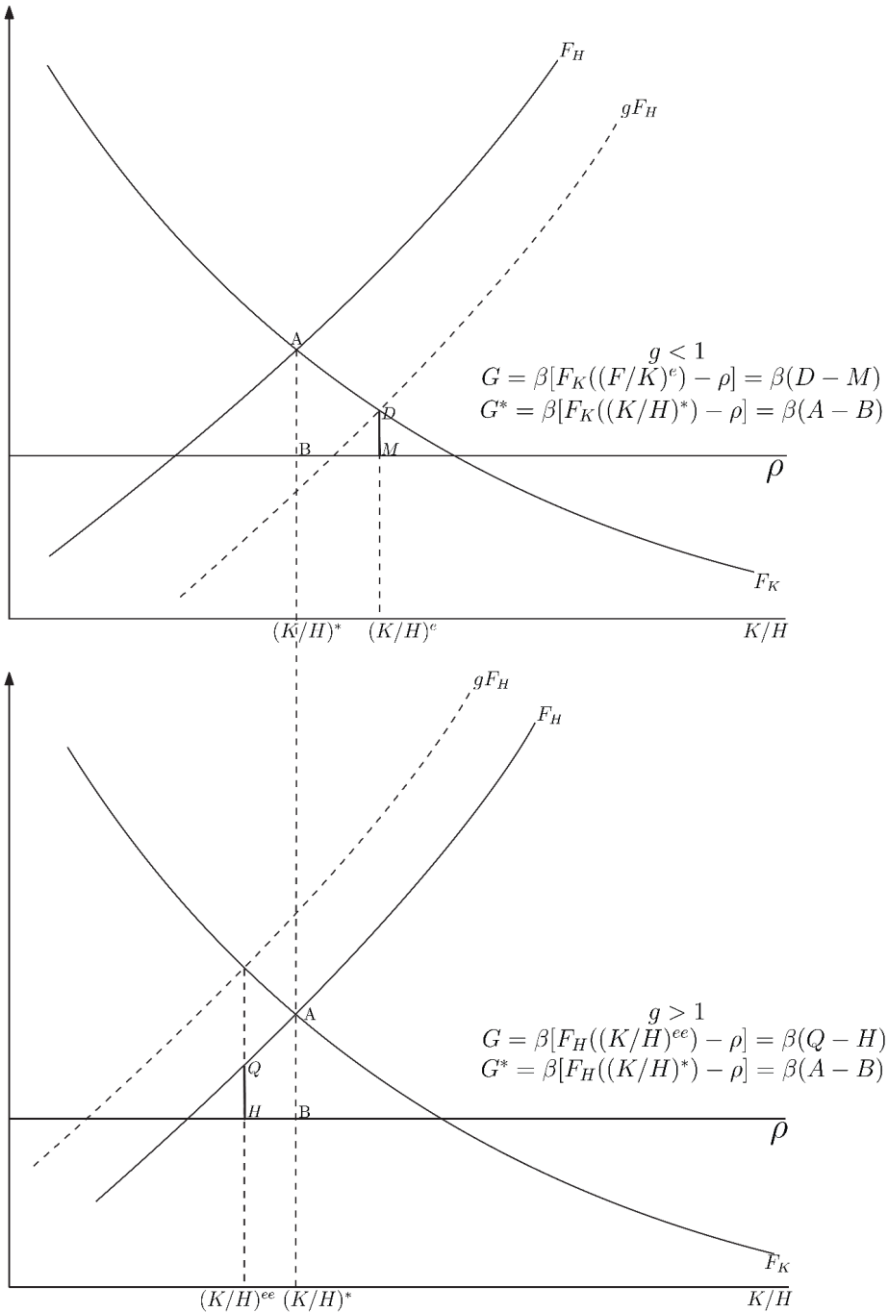

Figure A1. The determinants of balanced growth equilibrium under alternative patterns of capital market distortions