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Fiscal Policy and Growth in Africa: Fiscal Federalism, Decentralization and the Incidence of Taxation

Institutional Inefficiency, Income Inequality and Fiscal Policy

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Economic Commission for Africa

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Abstract

The paper develops a simple theoretical framework for the analysis of the interaction between institutional inefficiency, income inequality, government stability and redistributive fiscal policy. Theoretical predictions are then tested against a large panel of countries.

1. Introduction, motivation of the paper and links to the literature

High quality institutions, such as efficient bureaucracy, low corruption, good governance, rule of law, enforcement of property rights and contracts, low risk of government expropriation, are often identified as a critical factor in explaining cross-country differences in economic performance. Several papers document the adverse effect that inefficient institutions have on income, investment and growth (Mauro, 1995 and 1997; Keefer and Knack, 1995; Svensson, 1998; Easterly, 2000; Stevens, 2000; Kaufmann and Kraay, 2002). A growing body of literature has provided evidence on the negative impact of corruption on the productivity of public investment, the efficient allocation of public expenditure and the ability of countries to attract FDI (Tanzi and Davoodi, 1997; Wei, 1997a,b; Tanzi, 1998). Basic development outcomes (such as adult literacy, infant mortality and the rate of drop out from education) are also found to be inversely correlated with various measures of governance quality (Kaufmann et al. 1999; Rajkumar and Swaroop, 2002).

The focus of this paper is on institutional inefficiency as a determinant of income inequality. A few existing contributions have analysed the distributional effects of corruption (a specific form of inefficiency). Gupta et al. (1998) provide evidence that corruption increases the Gini coefficient and reduces the rate of income growth of the first quintile of income distribution in a large cross-section of countries. Li et al. (2000) suggest that the relationship between corruption and inequality might be non-linear. A theoretical rationale for non-linearities in the relationship is also provided by Ahlin (2001). In our analysis, we move beyond the characterisation of the impact of inefficiency on income distribution and we investigate the consequences that the relationship might bear in terms of government stability and fiscal policy. The idea is that more inefficient institutions, by making the distribution of income more unequal, are associated with smaller popular support for the incumbent government. Therefore, there is a threshold value of inefficiency above which the government[1] looses office (by either constitutional or unconstitutional means). However, through redistributive policy, the incumbent can compensate the negative political effect of inequality and hence increase the threshold value of institutional inefficiency that engines a regime change. This simple theoretical framework yields a set of testable predictions. First, inequality increases with the degree of inefficiency of institutions. But at sufficiently high levels of inefficiency, redistributive fiscal policy will be implemented by office-motivated incumbents. It is therefore possible that the relationship is inverted U shaped. Second, income of the poor and average income in the economy both decreases as institutional inefficiency

[1] In this paper we use the terms government, executive, regime and incumbent as synonymous to denote the political body with decision-making power.

grows. Again, the relationship can be mitigated (if not reversed) at high levels of inefficiency because of the incentive of the government to gain support through redistribution. Third, government stability is adversely affected by income inequality (and hence institutional inefficiency) and conversely it will be increased by redistributive policies. Fourth, there should be a positive correlation between institutional inefficiency and degree of redistribution, at least at sufficiently high levels of inefficiency.

Our paper is linked to several other strands of the political economy literature. One is the research on the determinants and the macroeconomic effects of income inequality. In addition to the classical Kuznets' argument (see Vanhoudt, 1998 for a recent formalization), several channels have been explored as potential sources of inequality. Tanzi (1998) points to the importance of social norms (such as institutions governing labor contracts, inheritance and marriage rules) at low stages of development and to government policies (spending on education, trade policy) in more advanced societies. Robinson (2001) also emphasizes the role of democratization, globalization, labor market institutions (i.e. degree of employment protection, minimum wages) and party ideologies. Econometric models also include proxies for ethno-linguistic and religious fractionalization as determinants of the Gini coefficient (Barro, 1999; Gradstein et al. 2000). Turning to the effects of income inequality, the issue that has probably received most attention is whether inequality is harmful for growth. Some theoretical models suggest that in more unequal societies, voters choose more redistributive taxation and this in turn depresses growth (Alesina and Rodrik, 1994; Persson and Tabellini, 1994). In fact, factors such as the endogeneity of political participation and the progressive structure of the tax system might lead to different outcomes (Saint Paul, 1996). The recent voluminous empirical literature has not produced unambiguous results (see, inter alia, Perotti, 1996; Barro, 1999; Forbes 2000). In the framework of our paper, some degree of inequality is built in the model from the beginning and it would persist even if institutions were completely efficient. However, when institutions are inefficient, individuals must pay an extra-cost to undertake investment projects. This has two effects. First, some individuals are forced to drop otherwise profitable projects and hence income inequality increases. Second, average income in the economy is reduced. The smaller number of profitable projects that are effectively undertaken also reduces growth prospects in the long-run. Redistributive policy, while providing the poor with a minimum income level, does not increase the number of projects that are undertaken. The econometric implication is thus that the degree of redistribution should not affect growth over and above the impact of institutional inefficiency.

A further relevant area of research is the one on the determinants of redistribution. In several theoretical contributions, redistribution is chosen by utility maximizing voters: the lower the income level of a voter relative to the mean income, the greater the desired level of redistribution of this voter. With single peaked preferences and majority rule, the politico-economic equilibrium is determined by the median voter. A more skewed distribution implies a lower

relative income of the median voter and hence more redistribution is chosen (i.e. Alesina and Rodrik, 1994; see also Drazen, 2000 for a survey). However, some counter-argument have been proposed. For instance, Peltzman (1980) suggests that the political competition between candidates that try to attract votes by promising transfers to supporters will lead to more redistribution if the society is more equal. In a recent contributions, Alesina and Angeletos (2002) suggests that the extent to which a given level of inequality translates into a given level of redistribution will depend on voters' beliefs about how fair social competition is. In countries where individuals think that each one's income depends on effort, then low redistribution is chosen. In countries where existing income disparities are seen mostly as the result of luck or privileged origins, more redistribution is favored. In addition to income inequality, a number of theoretical and empirical papers have stressed the importance of other political and economic factors, such as the specific features of the electoral system (Persson and Tabellini, 1999), the degree of political competition (Snyder and Yackovlev, 2000), the business cycle and the level of per-capita income (Clements et al. 1998; Snyder and Yackovlev, 2000; Sanz and Velazques, 2002), just to mention a few. In our contribution, redistribution is the tool available to the government to maintain political support when inefficiency grows. Thus, the size of redistribution is determined by two factors: (i) the proportion of total population that the incumbent needs to attract to remain in office (we refer to it as to "threshold value of consensus") and (ii) the extent of income inequality and hence of institutional inefficiency. Although not explicitly considered in the theoretical formulation, it is plausible to assume that the final impact on redistribution will depend on the interaction between the two factors above and some features of the political system. For instance, the share of popular consensus needed to remain in office might differ in democracies from authoritarian regimes, thus implying differences in the extent of redistributive policies, other things being equal.

Our analysis to some extent also relates to the literature on government stability. Models of government turnover explain the survival of the incumbent in terms of a broad sectors of factors pertaining to the structure of the ruling coalition (i.e. fragmentation, ideological homogeneity, size, tenure of the incumbent government), the rules of the game (i.e. parliamentary procedures, rules concerning votes of confidence), economic conditions (such as the rate of economic growth and the rate of inflation). The econometric analysis also takes into account the possibility that random events (as opposed to the structural factors listed above) will affect duration in office (see Warwick, 1994; Carmignani 2002 and the references therein). Our model suggests that the government is more stable the lower the degree of income inequality (and hence of institutional inefficiency). Furthermore, duration in office depends on the speed at which the quality of institutions deteriorates (in the absence of reforms) and on the maximum level of inefficiency that the incumbent can deliver without popular support falling below the threshold value of consensus. In turn this maximum level of inefficiency will depend on the expected efficiency of the alternative regime and on the possibility to use redistributive policies. There are some

problems in testing those predictions within the standard econometric framework used by the government duration literature. Nevertheless we will provide some evidence based on less sophisticated methods.

Finally, the paper bears implications (that are not fully explored and that might well represent a line of future research) for the determinants of the quality of institutions and for the political economy of reforms. In our setting, the implicit assumption is that the government can control the level of inefficiency. In the absence of any intervention (reform), inefficiency deteriorates at some given (low) rate. To avoid losing office, the government can undertake institutional reforms as an alternative to fiscal redistribution. Reforms will restore a sufficiently high level of efficiency and hence the government will re-build support to remain in office. The pattern of institutional reforms is therefore determined by the costs of reforms for the government, the rate at which institutions deteriorate and the maximum level of inefficiency that the government can tolerate. In the Appendix we provide a first attempt to formally characterize the pattern of reforms and hence the evolution of institutional quality over time.

The rest of the paper is organized as follows. In Section 2 we present the theoretical framework. In Section 3 some of the predictions of the model are tested using data for a large panel of countries. Section 4 concludes and sets the lines of future research in this field. Appendix 1 contains an attempt to formalize the pattern of institutional reforms. The definition of sources and variables used in the econometric analysis is given in Appendix 2. Appendix 3 contains the Tables with the simulation and econometric results.

2. Theoretical set-up

First, we introduce the basic set-up to explain how the inefficiency of institutions affects the distribution of income in the economy. Then, we study the link between inequality (and inefficiency) on one side and consensus and government survival on the other side. Finally, we introduce fiscal redistribution as a tool available to the incumbent to compensate the perverse effects of income inequality on consensus and stability in office.

2.1 A simple model of income distribution and institutional inefficiency.

The generic individual i in the economy has access to an investment project that generates an income R_i and that requires a degree C_i of interaction with institutions. For instance, C_i can be taken to represent the number of patents that individual i must obtain or the number of contacts with the public administration (i.e. state-owned enterprises, bureaucratic offices) or the expected frequency of recourse to the judicial system to enforce contracts and to secure property rights.

R and C are two continuously distributed random variables, with density functions respectively given by $F(R)$ and $F(C)$ and compact supports $[0, R_{max}]$ and $[0, C_{max}]$. The associated *pdf* are $f(R)$ and $f(C)$. It is further assumed that R and C are independent, so that the joint *pdf* is $f(R,C) = f(R)f(C)$. Although the basic argument is developed for generic distributions, analytical tractability will in some cases require the additional assumption that distributions are uniform with identical supports [0, 1]. Finally, the size of the population is normalized to 1.

Interactions with institutions are costly. This cost has two components. The first one is proportional to the specific C_i associated with each project. The second one is a function of the quality of institutions, with higher quality implying lower cost. If we let α ($\alpha \geq 0$) denote overall institutional inefficiency, then we can assume that the cost is specified as αC_i. Each individual in the population chooses whether to undertake the project or not. If he undertakes the projects (that is, if he "participates"), then he will earn an income equal to $R_i - \alpha C_i$. If instead he does not undertake the project (that is, if he "does not participate"), then he will earn a zero income. The condition for participation for generic individual i can thus be written as $R_i - \alpha C_i \geq 0$. That is, an individual will participate only if the return from the project, net of the costs of interactions with institutions, is positive [2]. Formally, set $\alpha^* = R_{max}/C_{max}$. Define $C^+ = R_{max}/\alpha$ if $\alpha \geq \alpha^*$ and $C^+ = C_{max}$ if $\alpha < \alpha^*$. In words, C^+ denotes the maximum value that C can take given the slope of the cut-off line. The proportion of participants is then written as:

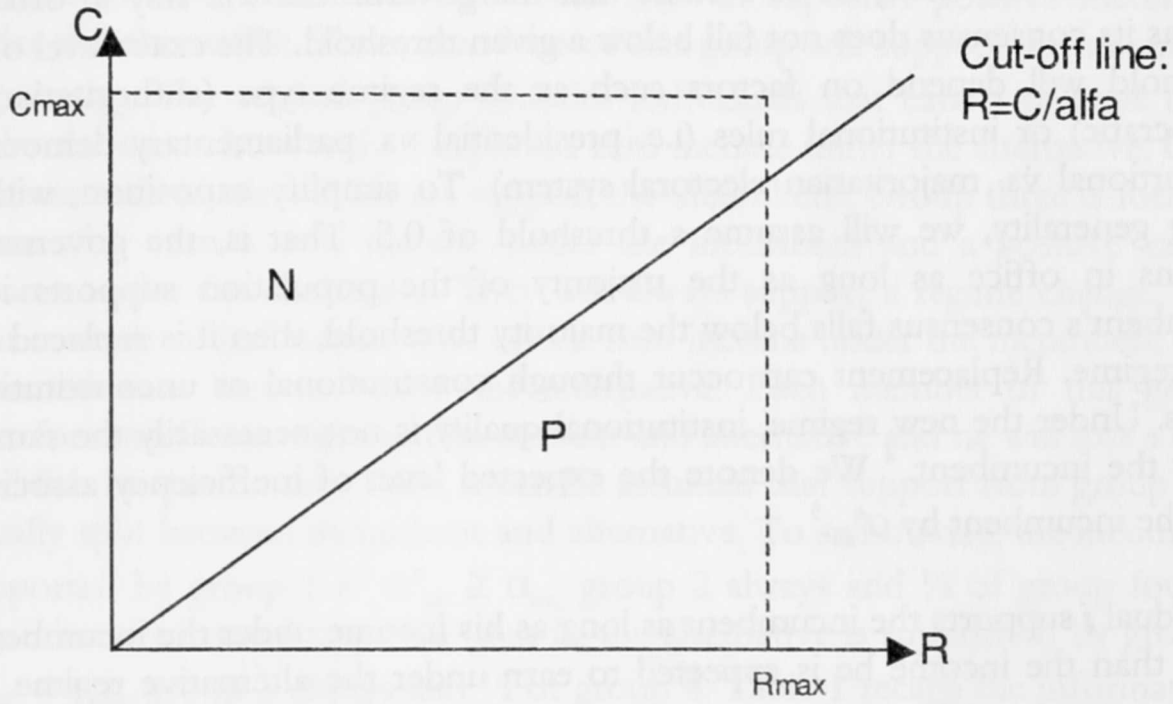
$$(1) \qquad P = \int_0^{C^+} \int_{\alpha C}^{R_{max}} f(R,C)\,dR\,dC$$

It is immediately clear from eq. (1) that any increase in the degree of inefficiency α will reduce the proportion of participants. Thus, more inefficient institutions are associated with a greater share of people receiving zero income or, equivalently, with a strictly positive income being allocated to a smaller share of population. The implication is that the average income levels of the bottom quintiles of income distribution will decrease. One could also say that the number of the poor in the society will increase. All these effects work in the sense of increasing Gini coefficient statistics.

[2] Note that all individuals participate for $\alpha = 0$. The intuition is that when institutions are fully efficient, the cost of interactions with them is zero and hence any project yielding a non-negative income is undertaken.

Figure 1 summarizes the basic set-up. In the Cartesian space (*R, C*), individual *i* is identified by a specific pair (R_i, C_i) [3]. The equation line $C = R/\alpha$ represents the participation condition and separates participants (P), located below the line, and non participants (N), located above the line. Higher inefficiency, represented by larger values of α, implies a flatter cut-off line and hence a greater share of non participants.

Figure 1: Basic Set-up



The set-up also bears implications for economic growth. First of all, notice that lower institutional quality is associated with a decrease in the economy-wide average income level. This immediately follows from the fact that as α increases, some of those who previously earned a positive income end up earning a zero income, whilst those who continue to participate must pay greater costs of interaction with institutions. Total income in the economy, defined as the sum of income all individuals, is also lower when institutions are of lower quality. Moreover, if one interprets projects as investment in human (or physical) capital, then the a reduction in the number of participants will imply a lower rate of factor accumulation, thus worsening growth prospects in the long-run.

2.2 Government survival and consensus

Casual observation and econometric evidence suggest that the duration in office of the executive is endogenous to several political and economic factors. The lack

[3] This representation is akin to Mankiw (1985), who studies the role of asymmetric information in financial markets.

of popular support is one of the causes which may trigger regime turnover both in democracies (i.e. through anticipated elections or government crises before that the constitutionally established term of office is completed) and authoritarian regimes (i.e. through revolutions and coups). It is therefore important in our model to study how growing inefficiency and inequality can affect the survival in office of the incumbent. In particular, as the number of those who do not participate because of inefficient institutions increases, popular consensus for the incumbent is likely to be eroded. This poses a constraint on the maximum level of inefficiency that an office-motivated government can tolerate.

To formalize the issue, let us assume that the government will stay in office as long as its consensus does not fall below a given threshold. The exact level of the threshold will depend on factors such as the regime type (authoritarian vs. democratic) or institutional rules (i.e. presidential vs. parliamentary democracy, proportional vs. majoritarian electoral system). To simplify exposition, without losing generality, we will assume a threshold of 0.5. That is, the government remains in office as long as the majority of the population supports it. If incumbent's consensus falls below the majority threshold, then it is replaced by a new regime. Replacement can occur through constitutional or unconstitutional means. Under the new regime, institutional quality is not necessarily the same as under the incumbent. [4] We denote the expected level of inefficiency associated with the incumbent by α^e_{alt}.[5]

Individual i supports the incumbent as long as his income under the incumbent is larger than the income he is expected to earn under the alternative regime. Let α_{inc} denote the (observed) current level of inefficiency associated with the incumbent regime. Then, agent i's income under the incumbent (I^i_{inc}) is:

$$
(2) \quad \begin{aligned} I^i_{inc} &= R_i - \alpha_{inc} C_i \qquad \text{if } R_i \geq \alpha_{inc} C_i \\ I^i_{inc} &= 0 \qquad\qquad\qquad \text{otherwise} \end{aligned}
$$

Similarly, agent i's expected income under the alternative (I^i_{alt}) is:

[4] Ahlin (2001) discusses a model where individuals can vote out of office a corrupted incumbent. However he assumes that the new government automatically carries on the corruption level committed to by the old government.

[5] It is assumed that the expectation α^e_{alt} is formed rationally. Individuals know that the αs are randomly dawn from a distribution $F(\alpha)$ with given supports. In the absence of a commitment technology, α^e_{alt} will be equal to the mathematical expectation of α. If instead, the alternative can take a credible commitment to some given level of inefficiency α^{comm}, then $\alpha^e_{alt} = \alpha^{comm}$ (clearly, the alternative government has an incentive to make its commitment public only if α^{comm} is smaller than the mathematical expectation of α). In fact, the general argument developed below does not depend on the specific value chosen for α^e_{alt}.

$$(3)\quad \begin{aligned} I^i_{alt} &= R_i - \alpha^e_{alt} C_i && \text{if } R_i \geq \alpha^e_{alt} C_i \\ I^i_{alt} &= 0 && \text{otherwise} \end{aligned}$$

Note that the implicit assumption, to be removed later, is that the degree of interaction with institutions of each project is not affected by the change in regime.

From equations (2) and (3) it can be seen that any individual in the economy will fall in one of four possible groups[6]. The first group consists of those who earn a positive income under the incumbent and an expected positive income also under the alternative. Then, members of this group will support the incumbent if $\alpha^e_{alt} \geq \alpha_{inc}$. The second group includes individuals that earn a positive income under the incumbent and an expected zero income under the alternative. Clearly, all these individuals will always support the incumbent. Group three is formed by those who earn a zero income under the incumbent and a positive expected income under the alternative. They will always support a regime change. Group four is made of individuals who earn a zero income under the incumbent and an expected zero income under the alternative. Each member of this group is therefore indifferent between incumbent and alternative and he will toss a coin to establish his preference. Thus, it can be assumed that support from group four is equally split between incumbent and alternative. To summarize, the incumbent is supported by group 1 if $\alpha^e_{alt} \geq \alpha_{inc}$, group 2 always and ½ of group four. The incumbent is instead opposed (that is, the alternative is supported) by group 1 if $\alpha^e_{alt} < \alpha_{inc}$, group 3 always and ½ of group 4. Table 1 recaps the information on groups and support for the incumbent. In the Table, P_{inc} denotes the share of participants under the incumbent and P_{alt} the share of expected participants under the alternative. These are formally computed by replacing α in equation (1) with α_{inc} and α^e_{alt} respectively. The shares of non participants are denoted by N_{inc} and N_{alt}, with $P_{inc} + N_{inc} = 1$ and $P_{alt} + N_{alt} = 1$

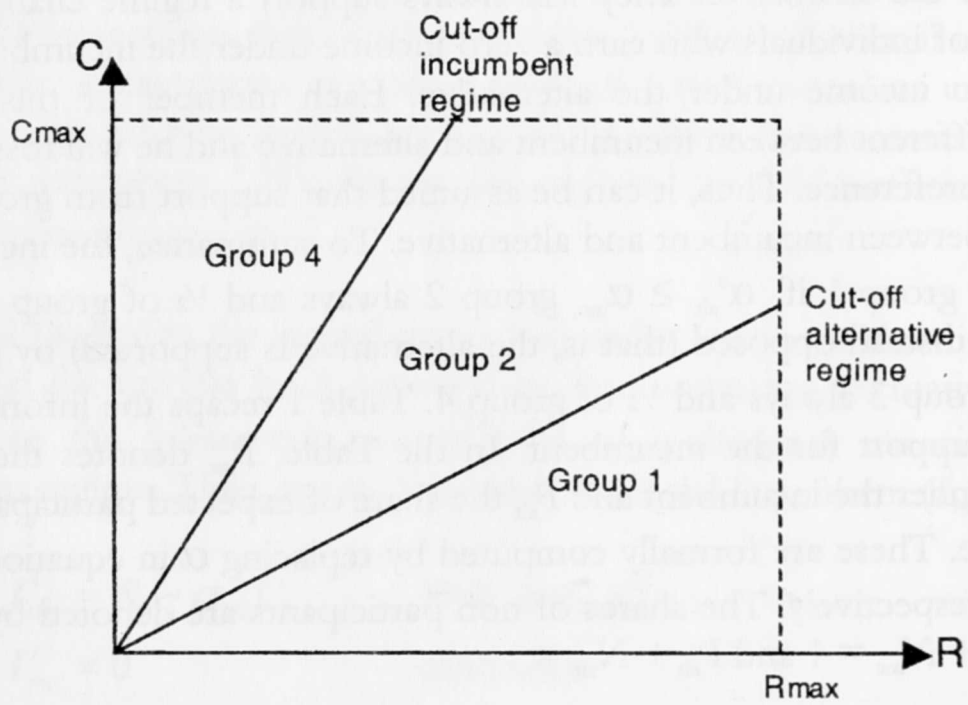
Table 1
Groups and support for the incumbent regime

	GROUP 1	GROUP 2	GROUP 3	GROUP 4
$\alpha^e_{alt} \geq \alpha_{inc}$	P_{alt} Support	$P_{inc} \cap N_{alt}$ Support	Empty	N_{inc} ½ support, ½ no support
$\alpha^e_{alt} < \alpha_{inc}$	P_{inc} No support	Empty	$P_{alt} \cap N_{inc}$ No support	N_{alt} ½ support, ½ no support

[6] The analysis that follows holds independently on whether α_{inc} and α^e_{alt} are larger than, smaller than or equal to the ratio R_{max}/C_{max}

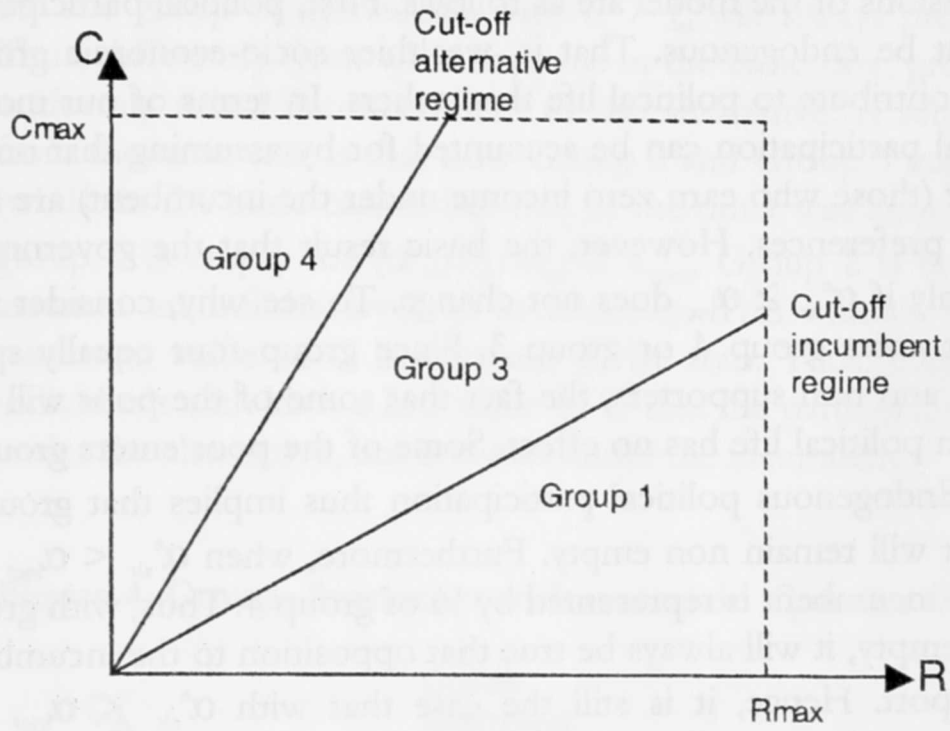
Because any individual either supports the incumbent or opposes it (and hence supports the alternative), the necessary and sufficient condition for the 0.5 threshold of consensus to be satisfied is that total support for the incumbent exceeds total support for the alternative. We identify the inefficiency levels for which this condition is met. Consider first the case where $\alpha^e_{alt} \geq \alpha_{inc}$, depicted in Figure 2.The cut-off line under the alternative is flatter. This means that there are some individuals who participate under the incumbent and who are expected not to participate under the alternative. However, any individual who expects to participate under the alternative must also earn a positive income under the incumbent. Therefore, group 3 is empty. The other groups are non-empty. Group 1, group 2 and ½ group 4 supports the incumbent. The opposition is limited to ½ of group 4 supporting the alternative, so that popular consensus for the incumbent is certainly greater than 0.5.

Figure 2: Groups formation when $\alpha_{inc} \leq \alpha^e_{alt}$



Consider now the case $\alpha^e_{alt} < \alpha_{inc}$, represented in Figure 3. With the cut-off line under the incumbent which is flatter, the empty group is now group 2. Group 1 however now supports the alternative, together with group 3 and half of group 4. Supports for the incumbent drops to ½ of group four. Thus, support for the alternative is certainly greater than support for the incumbent and hence the consensus threshold for survival is not met.

Figure 3: Groups formation when $\alpha_{inc} \leq \alpha^{e}_{alt}$



The conclusion is thus that a necessary and sufficient condition for the incumbent to survive in office is that the quality of institutions does not fall below the level that would be associated with an alternative regime. The result hinges on the effects that inefficiency has on income distribution. Higher inefficiency implies: (i) a greater number of individuals earning zero income, (ii) a larger number of individuals that expect to earn positive income under the alternative regime, (iii) for those who earn a positive income under both regimes, the alternative regime tend to generate higher net income. All these three effects contribute to eroding consensus for the incumbent.

To some extent, the government has control over the quality of institutions. For instance, appropriate reforms can reduce α. However, since reforms are costly, an incentive must be provided for the incumbent to undertake them. The above analysis suggests that competition for office can provide such an incentive. However, this does not necessarily mean that in a democratic regime, where competition for office is strong, inefficiency is low. Whether this will be effectively the case depends on the value of the political alternative to the incumbent government. If the alternative is expected to deliver high inefficiency, then there will be little pressure on the incumbent to reform institutions to

enhance efficiency. This suggests the possibility that some countries will be trapped into low efficiency equilibria.

2.3 Extensions

Two plausible extensions of the model are as follows. First, political participation of individuals might be endogenous. That is, wealthier socio-economic groups are more likely to contribute to political life than others. In terms of our model, endogenous political participation can be accounted for by assuming that only a fraction of the poor (those who earn zero income under the incumbent) are able to express political preferences. However, the basic result that the government remains in office only if $\alpha^e_{alt} \geq \alpha_{inc}$ does not change. To see why, consider that the poor can either enter group 4 or group 3. Since group four equally splits between supporters and non supporters, the fact that some of the poor will not play an active role in political life has no effect. Some of the poor enters group 3 when $\alpha^e_{alt} < \alpha_{inc}$. Endogenous political participation thus implies that group 3 shrinks. However, it will remain non empty. Furthermore, when $\alpha^e_{alt} < \alpha_{inc}$, the only support for the incumbent is represented by ½ of group 4. Thus, with group 1 and group 3 non empty, it will always be true that opposition to the incumbent is greater than support. Hence, it is still the case that with $\alpha^e_{alt} < \alpha_{inc}$, the incumbent does not survive even though the size of the opposition is reduced. When $\alpha^e_{alt} \geq \alpha_{inc}$ group 3 is empty and hence the assumption of endogenous political participation does not alter the conclusion that in this case the incumbent survives.

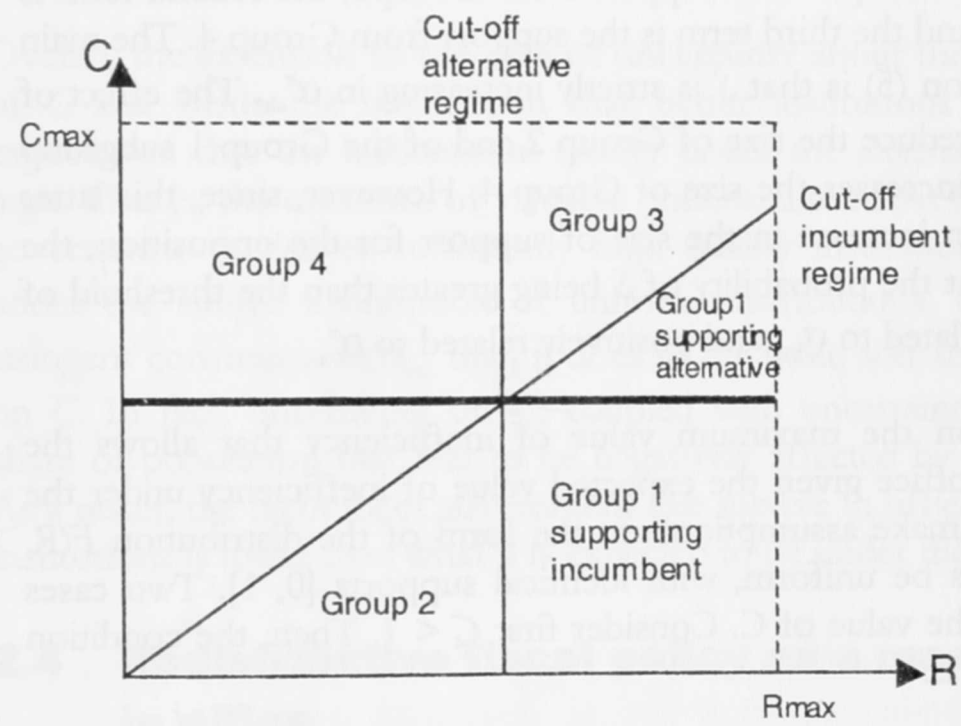
Potentially more relevant is the second extension. So far, it has been assumed that the degree of interaction with institutions C associated with each project does not change if the incumbent government is replaced. However, it might be the case that once a new regime is established, not only the overall quality of institutions, but also the rules disciplining the interaction between institutions and the economy change. Thus, we must allow for changes in C. Specifically, let us assume that individuals in the economy knows that the degree C_i of their project may be changed. However, before that the new regime is effectively in place, they do not know exactly what the new C_i will be. They can form a rational expectation given the information on the distribution of C. Let C^e be this rational expectation.[7] Equation (3) thus becomes

$$(4) \qquad \begin{aligned} I^i_{alt} &= R_i - \alpha^e_{alt} C^e && \text{if } R_i \geq \alpha^e_{alt} C^e \\ I^i_{alt} &= 0 && \text{otherwise} \end{aligned}$$

[7] Note that all individuals share the same expectation. This follows from the fact that (i) C is distributed independently from R and hence the known value of R_i bears no relevance for the formation of the expectation and that (ii) all individuals share the same information on the moments of the distribution of C.

The partition of the population into groups has to be changed according to (4). Figure 4 presents the new partition. The cut-off line under the alternative is now vertical at $R = \alpha^{c}_{alt}C^{c}$. This intersects the cut-off line under the incumbent at $\underline{C} = (\alpha^{c}_{alt}C^{c})/\alpha_{inc}$. Correspondingly, group 1 is partitioned in two sub-groups. The sub-group of individuals with $C^{i} \leq \underline{C}$ will always support the incumbent, whilst the sub group of individuals with $C^{i} > \underline{C}$ will always prefer the regime change. Thus, differently from what happens in the basic case, group 1 does not support uniformly either the incumbent or the alternative. A second relevant departure from the basic case is that now Group 2 and Group 3 might be both non empty (whilst in the basic case either one or the other was empty). Furthermore, whilst group 3 is empty for $(\alpha^{c}_{alt}C^{c})/\alpha_{inc} \geq C_{max}$, Group 2 is never empty, unless one assumes an infinite level of inefficiency. This follows from the fact that the minimum value of C is assumed to be zero. Thus, there will always be some individuals with such a low value of C^{i} that the participation condition is not met under the alternative, but it is met under the incumbent.

Figure 4: Groups formation with uncertain C_i under the new regime



The fact that Group 1 now splits its support, whilst Group 2 and Group 3 can be contemporaneously non-empty slightly complicates the analysis of the conditions under which a sufficient consensus is maintained for the incumbent to survive in office. However, consider that Group 2 is always supporter of the government, Group 3 is always supporter of a change and Group 4 is always neutral, in the sense that its support is equally split between support and no support.

The share of support for the incumbent is therefore formally defined as:

$$S = \int_0^{\underline{C}} \int_{\hat{\alpha}}^{R_{\max}} f(R,C)dRdC + \int_0^{\underline{C}} \int_{\tilde{\alpha}}^{\hat{\alpha}} f(R,C)dRdC + \frac{1}{2}\left[\int_0^{\underline{C}} \int_0^{\hat{\alpha}} f(R,C)dRdC + \int_0^{\underline{C}} \int_0^{\tilde{\alpha}} f(R,C)dRdC + \right] \tag{5}$$

where we make use of the following notation $\hat{\alpha} \equiv \alpha^e_{alt} C^e$ and $\tilde{\alpha} \equiv \alpha_{inc} C$.

The first term on the r.h.s. represents support from Group1, the second term is support from Group 2 and the third term is the support from Group 4. The main crucial feature of equation (5) is that S is strictly increasing in α^e_{alt}. The effect of an increase in α_{inc} is to reduce the size of Group 2 and of the Group 1 subgroup of supporters, whilst it increases the size of Group 4. However, since, this latter is exactly matched by an increase in the size of support for the opposition, the overall conclusion is that the probability of S being greater than the threshold of consensus is inversely related to α_{inc} and positively related to α^e_{alt}.

To be more specific on the maximum value of inefficiency that allows the incumbent to preserve office given the expected value of inefficiency under the alternative, we need to make assumptions on the form of the distribution $F(R, C)$. Let the distributions be uniform, with identical supports [0, 1]. Two cases emerge, depending on the value of C. Consider first $\underline{C} < 1$. Then, the condition for government survival is:

$$\frac{(2-\hat{\alpha})\underline{C}}{2} \geq (1-\hat{\alpha})(1-\underline{C}) \tag{6}$$

Under the stated assumption, the mathematical expectation of C is simply 0.5. From equation (6), the maximum value of α_{inc} as a function of α^e_{alt} is immediately obtained as[8]:

[8] Note that the assumption of compact supports [0, 1] implies that if $\alpha^e_{alt} C^e > 1$, then nobody expects to participate under the alternative regime. Then, the incumbent stays in office for any finite value of inefficiency, independently from the value of α^e_{alt}.

$$(7) \qquad \alpha_{inc} = \frac{1}{2}\left[\frac{2\alpha^{e}_{alt} - 3\frac{\left(\alpha^{e}_{alt}\right)^{2}}{4}}{1 - \frac{\alpha^{e}_{alt}}{2}}\right]$$

It can be seen that the r.h.s. of equation (7) is greater than α^{e}_{alt} for $\alpha^{e}_{alt} < 2$ (if $\alpha^{e}_{alt} > 2$, then $\alpha^{e}_{alt}C^{e} > 1$ and the argument in footnote 8 applies). This means that the maximum level of inefficiency associated with government survival is greater than the expected value of inefficiency under the alternative. That is, the incumbent government is subject to a softer efficiency constraint relative to the basic case, where the survival condition is $\alpha^{e}_{alt} \geq \alpha_{inc}$. The intuition underlying this result is that the government is benefiting from a form of *status-quo bias*: uncertainty over the future value of *C* implies a stronger support for the current regime. In the case where $\underline{C} \geq 1$, Group 1 is empty and the whole of Group 1 supports the incumbent, so that the incumbent always enjoys sufficient support to remain in office.

Overall, the extension to the case of uncertainty about the future possible value of *C* still yields the implication that better institutions are enforced by the expectation that the institutional quality under the alternative regime would be high. That is, the existence of valuable political alternatives forces the incumbent government to deliver sufficiently high quality institutions. However, at least under the simple assumption of uniform distributions, α^{e}_{alt} constitutes a less stringent constraint on α_{inc} than it does in the basic scenario with no uncertainty on *C*. In fact, uncertainty on C, coupled with uncertainty on α, increases the share of population that fear to be negatively affected by the change in regime. As a result, the incumbent government can survive in office even if the quality of institutions is lower than what it is expected to be under the alternative regime.

2.4 Redistributive fiscal policy as a mean to survive in office

When the quality of institutions deteriorates above the level that ensures survival in office, the incumbent can undertake two possible courses of action. The first one is to implement institutional reforms. The timing and the depth of such reforms will depend on the political and monetary costs that they imply. In Appendix 1 an attempt to formalize of the dynamics of reforms is presented. The second option is to use redistributive fiscal policy. The reason why consensus falls when inefficiency increases is that income distribution becomes more unequal. Through redistribution the incumbent can compensate the adverse political effects of inequality.

The critical problem associated with any program of redistribution is the one of how to finance it. The following example clarifies the issue in the context of our model. Consider the basic case scenario, where survival in office requires that $\alpha_{inc} \leq \alpha^e_{alt}$. Assume that the quality of institutions has deteriorated up to a point $\alpha_{inc} > \alpha^e_{alt}$ and hence that the government is facing a consensus falling below the majority threshold. To regain popular support, a lump-sum transfer of amount $\nu = (\alpha_{inc} - \alpha^e_{alt})C_i + \varepsilon$, where $\varepsilon > 0$, is paid to any individual i who decides to participate under the incumbent. Note that this transfer effectively takes the form of a subsidy paid to any individual undertaking a project. The effects on consensus are easy to determine. Individuals in Group 1, who would not support the incumbent without subsidy, now fully support the incumbent. Similarly, individuals in Group 3 switch their support from the alternative to the incumbent. Furthermore, a small proportion of individuals in Group 4 (those close to the cut-off line $C = R/\alpha^e_{alt}$) now participate and vote for the incumbent. The rest of Group 4 evenly splits between the two regimes. The result is that the government remains in office even if $\alpha_{inc} > \alpha^e_{alt}$ and there is no uncertainty on the post-regime change value of C. The total sum to be paid by the government is:

$$(8) \qquad G = \nu \int_0^{C^+} \int_{\alpha_{inc}C-\varepsilon}^{R_{max}} f(R,C)\,dR\,dC$$

where C^+ is defined as in equation (1).

The amount determined by equation (8), however, cannot be financed through taxation. This is clear since the beneficiaries of the fiscal program are those who already earn a positive income and taxes cannot be levied on those who earn a zero income. The implication is that, if the government decides to undertake such a program, a fiscal deficit will arise. In other words, the program does allow the government to remain in office while inefficiency of institutions is high, but it rises the issue of financial sustainability.

In what follows we discuss three possible redistributive strategies under the assumption that the static balanced budget constraint must hold: that is, redistributive expenditure must be fully covered through taxation. The assumptions that transfers and taxes are lump-sum and that the survival condition is $\alpha_{inc} \leq \alpha^e_{alt}$ are retained.

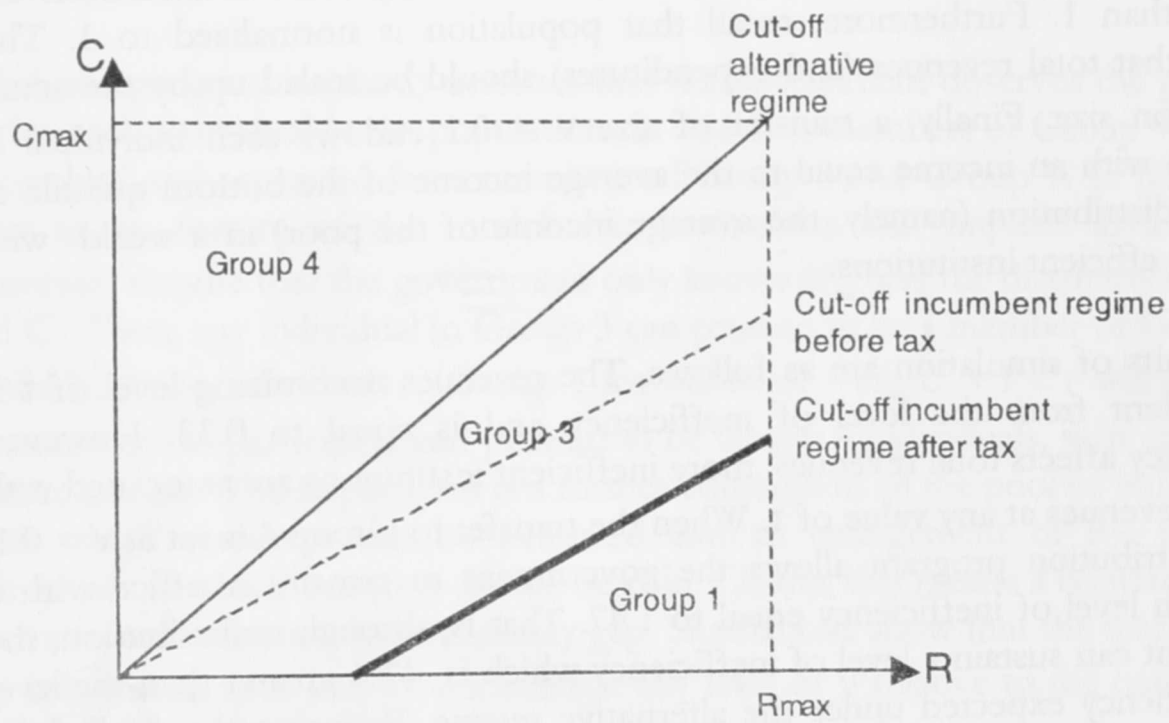
2.4.1 A standard program of transfers and taxation

The design of the redistributive program that the government can undertake will depend upon the size of the four groups in which the population is partitioned. We start by considering the following case. Let α^m denote the value of α such that the corresponding share of non participants is exactly equal to ½ of the

population. Then, assume $\alpha^e_{alt} = \alpha^m$ and $\alpha_{inc} > \alpha^e_{alt}$. In that case, a simple, purely redistributive program, can be implemented to ensure government survival: a tax τ is charged on all those who participate under the incumbent and funds are used to pay a transfer ν to any member of Group 4.

The effects of the proposed program are presented in Figure 5. With $\alpha_{inc} > \alpha^e_{alt}$, Group 2 is empty, Group 1 coincides with the participants under the incumbent and Group 4 coincides with the expected non participants under the alternative. Support for the incumbent comes only from ½ of Group 4 and it is therefore insufficient to meet the 0.5 majority threshold. The imposition of a lump-sum tax on participants shifts the cut-off line of the incumbent downward, with a flow of individuals from Group 1 to Group 3. The size of Group 4 is unaffected and Group 2 remains empty. However, now every individual in Group 4 receives a strictly positive income and hence he will prefer the incumbent to the alternative. As a result, the incumbent receives full supports from Group 4. With $\alpha^e_{alt} = \alpha^m$, this group alone accounts for one half of total population and hence its full support is sufficient for the incumbent to remain in office.

Figure 5: Groups formation with a purely redistributive program (the labeling of groups refers to the after tax partition)



It is clear from Figure 5, however, that the inefficiency gap (that is, the difference between α_{inc} and α^e_{alt}) which can be compensated through redistribution is limited. More formally, total redistributive expenditure is equal to $G_1 = \nu/2$. Total revenues are instead equal to:

$$(10)\quad F_1 = \nu \int_0^{\frac{R_{\max}-\tau}{\alpha_{inc}}} \int_{\alpha_{inc}+\tau}^{R_{\max}} f(R,C)\,dR\,dC \qquad \text{if } C_{\max} \geq \frac{R_{\max}-\tau}{\alpha_{inc}}$$

$$F_1 = \nu \int_0^{C_{\max}} \int_{\alpha_{inc}+\tau}^{R_{\max}} f(R,C)\,dR\,dC \qquad \text{if } C_{\max} < \frac{R_{\max}-\tau}{\alpha_{inc}}$$

The balanced budget constraints requires that $G_1 = F_1$. From equation (10), it can be seen that less efficient institutions lower revenues from taxation. This means that as α_{inc} grows, and the inefficiency gap widens, higher taxation will be required to meet the budget constraint. However, the effect of higher τ on total revenues is twofold. On the one hand, more revenues are collected from each taxpayer. On the other hand, the number of taxpayers decreases. This is a standard Laffer-type argument, implying that there is a maximum amount of revenues that can be extracted from taxation, and hence a maximum amount of transfers that can be paid out.

Table A1 in Appendix 3 reports simulations of the budget constraint under the assumption of uniform distributions for R and *C*, with identical supports [0, 1]. Note that, because we are focusing on the case where $\alpha_{inc} > \alpha^{e}_{alt} > \alpha^{m}$, and $\alpha^{m} = 1$ under the stated assumptions, values of inefficiency in the simulations are greater than 1. Furthermore, recall that population is normalized to 1. This implies that total revenues (and expenditures) should be scaled up by the actual population size. Finally, a transfer of size $\nu = 0.1$ endows each individual in Group 4 with an income equal to the average income of the bottom quintile of income distribution (namely, the average income of the poor) in a world with perfectly efficient institutions.

Key results of simulation are as follows. The revenues maximizing level of τ is independent from the level of inefficiency and is equal to 0.33. However, inefficiency affects total revenues: more inefficient institutions are associated with smaller revenues at any value of τ. When the transfer to Group 4 is set at $\nu = 0.1$, the redistribution program allows the government to remain in office with a maximum level of inefficiency equal to 1.47. That is, through redistribution, the incumbent can sustain a level of inefficiency which is 47% greater than the level of inefficiency expected under the alternative regime. Reducing the size of the transfer increases the sustainable inefficiency gap. Thus, without lower bound on the size of the transfer, the redistribution plan allows the government to let inefficiency grow almost unconstrained. On the other hand, increasing the size of the payment above $\nu = 0.133$ makes it impossible for the incumbent to meet the balanced budget constraint.

The simulation shows that effectively the redistribution program can guarantee survival in office even in the presence of high levels of inefficiency. A few

additional comments are noteworthy. First, one of the results is that the smaller the size of the transfer payment, the higher the sustainable level of inefficiency. How small a transfer can be is an empirical matter. However, a possible lower bound can be represented by the poverty line. In that case, the values of $\nu = 0.1$ and $\nu = 0.05$ used in the simulations might effectively be regarded as lower bounds (depending on the relevant definition of poverty line).

Second, the results discussed above extend to the case where $\alpha^e_{alt} > \alpha^m$. In that case Group 4 is actually larger than ½ of the population. The government can either decide to pay the transfer to all individuals in Group 4 (thus obtaining consensus larger than the 0.5) or target the program only on exactly ½ of the population. In the first case the maximum sustainable inefficiency gap will be smaller than in the second case. For instance, simulations show that for $\nu = 0.1$, an expected inefficiency level under the alternative equal to 1.15 is associated with a maximum level of inefficiency under the incumbent of 1.3, thus limiting the sustainable inefficiency gap to some 13%. Targeting strictly ½ of the population would instead imply a sustainable inefficiency gap of about 30%. The problem of strict targeting is that the government would discriminate among individuals in the same group, and this is not always politically feasible. The case where $\alpha^e_{alt} < \alpha^m$ involves more complications and it is discussed below (subsections 2.4.2 and 2.4.3).

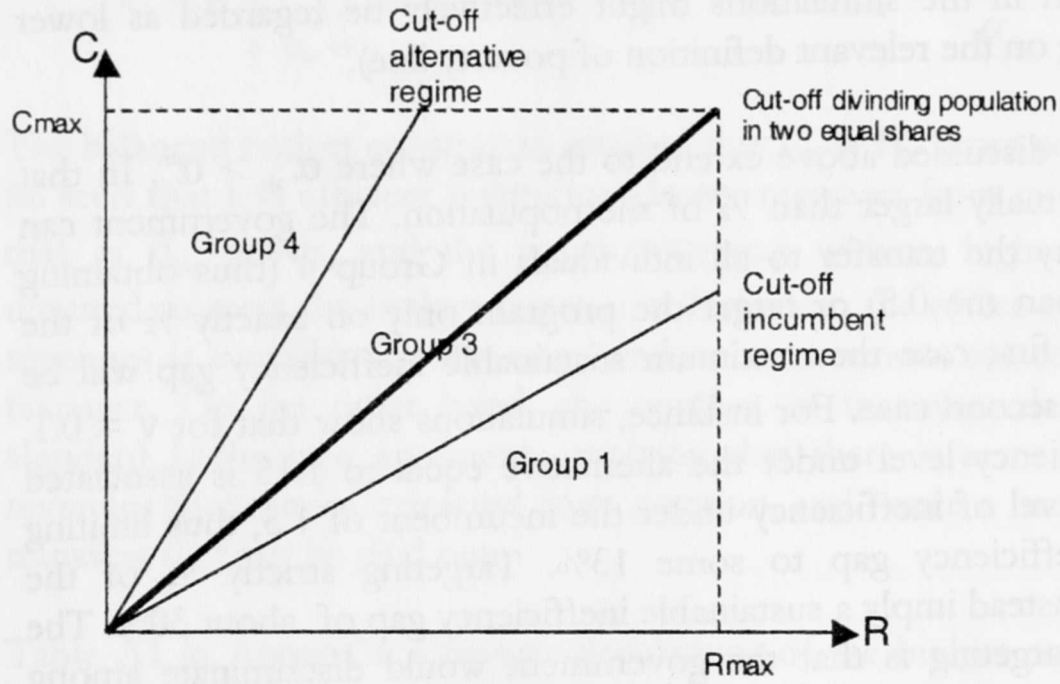
Third, the program implicitly assumes that the government observes the pair (R_i, C_i) for each individual in the population. In this way, members of Group 4 can be recognized and separated from members of Group 3 and Group 1. In principle, there is no feature of the model that contradicts that implicit assumption. However, assume that the government only knows α^e_{alt} and the distributions of R and C. Then, any individual in Group 3 can pretend to be a member of Group 4. Similarly, those individuals in Group 1 for whom $R_i - \alpha_{inc} C_i - \tau < \nu$ will have an incentive not to participate and pretend to be Group 4 individuals, thus earning a greater income. The implication is a further contraction of the pool of individuals from which resources can be extracted and an enlargement of the pool of individuals to which transfers should be paid. Clearly, this means a contraction of the maximum sustainable inefficiency gap. Simulations show that the inefficiency gap is between 15% and 45% smaller at any level of ν relative to the case where R_i and C_i are perfectly observed.

2.4.2 Redistribution with high-efficiency alternative regimes

We now turn to the case of a highly efficient alternative regime and consider possible redistributive programmes when $\alpha^e_{alt} < \alpha^m$. The groups partition of the population is depicted in Figure 6. Group 2 is again empty, whilst Group 4 now includes less than ½ of total population. Group 1 and Group 3 favor a change of regime. To remain in power with $\alpha^e_{alt} < \alpha_{inc}$, in addition to support from Group

4, the incumbent must attract support from some individuals in either Group 1 or Group 3. We investigate the two strategies separately below.

Figure 6: Groups partition with a high efficiency alternative regime



Attracting support from some individuals in group 1

In the absence of any transfer, the income of any individual in Group 1 under the alternative regime is expected to be greater than his income under the incumbent regime. However, if a transfer of size $\upsilon_i = (\alpha_{inc} - \alpha^e_{alt})C_i + \varepsilon$, where ε is a strictly positive constant, paid to individual *i* in Group 1 would ensure that this individual switches its support from the alternative to the incumbent regime. The fiscal redistribution program that the government can undertake to maintain office can thus have the following two-tier structure. First, a transfer of size ν is paid to all individuals in Group 4, thus securing their full support. Second, the transfer υ_i is paid to a share of Group 1 individuals. This share must be large enough to meet the majority threshold of consensus when added to the size of Group 4. Of course, since the transfer υ_i increases the higher the cost C_i, the government will target low-cost individuals in Group 1.

Formally, define a cost $\tilde{c}$ such that:

$$(11) \quad S_4 + \int_0^{\tilde{c}} \int_{\alpha_{inc}C}^{R_{max}} f(R,C)dRdC = \frac{1}{2}$$

where S_4 denotes the size of Group 4 and it is formally obtained as:

$$S_4 = \int_0^{R_{\max}} \int_{R/\alpha^e_{alt}}^{C_{\max}} f(R,C)dRdC \qquad \text{if } \alpha^e_{alt} \geq \frac{R_{\max}}{C_{\max}}$$

$$S_4 = \int_0^{C_{\max}} \int_0^{\alpha^e_{alt}C} f(R,C)dRdC \qquad \text{if } \alpha^e_{alt} < \frac{R_{\max}}{C_{\max}}$$

Equation (11) defines a threshold value for $\tilde{c}$ such that if attracting all individuals in Group 1 with $C_i \leq \tilde{c}$ plus all individuals in Group 4, then the incumbent stays in office. It is immediately clear that $\tilde{c}$ is greater the larger the consensus threshold for survival (here set at ½), the higher the degree of inefficiency under the incumbent regime and the more efficient the alternative regime is expected to be.

The total cost G_2 of the redistribution program is equal to:

$$\textbf{(12)} \qquad G_2 = \nu S_4 + \int_0^{\tilde{c}} \int_{\alpha_{inc}C}^{R_{\max}} \upsilon_i f(R,C)dRdC$$

This has to be financed by imposing a lump-sum tax τ on all the remaining individuals in Group 1 (that is, on individuals in group 1 with $C_i > \tilde{c}$. Revenues are therefore given by:

$$\textbf{(13)} \qquad \begin{aligned} F_2 &= \tau \int_{\tilde{c}}^{\frac{R_{\max}-\tau}{\alpha_{inc}}} \int_{\alpha_{inc}C+\tau}^{R_{\max}} f(R,C)dRdC \qquad \text{if } \frac{R_{\max}-\tau}{\alpha_{inc}} \leq C_{\max} \\ F_2 &= \tau \int_{\tilde{c}}^{C_{\max}} \int_{\alpha_{inc}C+\tau}^{R_{\max}} f(R,C)dRdC \qquad \text{if } \frac{R_{\max}-\tau}{\alpha_{inc}} > C_{\max} \end{aligned}$$

Other things being constant, revenues are decreasing in $\tilde{c}$. This is obvious since a greater $\tilde{c}$ implies a smaller number of taxpayers. Furthermore, as before, a Laffer-type argument applies: a greater lump sum tax τ increases the flow of resources received from each taxpayer but reduces the tax-base. F_2 is therefore maximized for some value of τ between 0 and 1.

The balanced budget constraint requires that $F_2 = G_2$. This in turn implies that the inefficiency gap α_{inc} - α^e_{alt} is upper bounded. The result is intuitive. As the inefficiency gap widens, the cost of attracting support from any individual in Group 1 increases. Furthermore, lower values of α^e_{alt} and higher values of α_{inc} increase $\tilde{c}$, thus increasing expenditure and reducing revenues. The maximum inefficiency gap that the incumbent can sustain through redistribution will depend on the starting value of α^e_{alt} and on the values of model parameters (i.e. ν

and ε). Table A2 in Appendix 3 reports the results of a simulation under the assumption of uniform distribution of *R* and *C*. The exogenous parameters are α^e_{alt} , ν and ε. The value $\tilde{c}$ necessary to ensure a ½ support for the incumbent, the revenue maximizing level of taxation (τ^*) and the maximum sustainable level of α_{inc} are all determined endogenously. The Table also reports the inefficiency gap in percent of inefficiency under the alternative, the size of group one in percent of total population and the share of group 1 individuals that are targeted by the redistribution programme, the total expenditure G_2 and fiscal revenues F_2. Because of the balanced budget constraint, these latter two items are equal.

A few crucial results can be highlighted. First of all, the maximum level of α_{inc} decreases the smaller is α^e_{alt} for any values of ν and ε. This confirms that the expected level of inefficiency under the alternative constraints the level of inefficiency under the incumbent. The actual extent of the inefficiency gap is greater the smaller the value of ν and ε. This is clear, since lower ν and ε implies lower expenditure at any level of inefficiency. Interestingly, there is level of α^e_{alt} that minimizes the inefficiency gap in percent. That is, when the alternative regime is expected to be very efficient, a further decrease in α^e_{alt} generates a less than proportional decrease in the maximum sustainable level of α_{inc}. This is largely due to the fact that the large size of Group 1 allows to collect proportionally more revenues. The minimum inefficiency gap is obtained for values of α^e_{alt} between 0.5 and 0.7 and oscillates between about 23% and 95%, depending on the chosen values of ν and ε. The share of individuals in Group 1 that need to be attracted to meet the majority threshold is larger the more efficient institutions are expected to be under the alternative regime. In percent of total population this share increases from about 2.5% when α^e_{alt} is very close to 1 (1 is the maximum for α^e_{alt} in this simulation) to 45% when α^e_{alt} is set at 0.1. Similarly, in proportion of total Group 1, the share of targeted individuals grows from 7% to 59%. Both results reflect the increase in $\tilde{c}$ associated with the decrease in the size of Group 4 at lower values of α^e_{alt}. Finally, a result with intriguing empirical implications is that the revenue maximizing level of taxation is on average higher at very high and very low levels of inefficiency (of both the incumbent and the current regime). To see why this is the case, consider that, within the limits incorporated by the Laffer-type relationship, a smaller number of tax-payers must be compensated by greater lump sum taxation. The number of taxpayers is in fact decreasing in α_{inc} and in $\tilde{c}$. In turn, those two parameters are jointly minimized at intermediate levels of α^e_{alt}, so that a U shaped relationship is established between τ^* and institutional inefficiency.

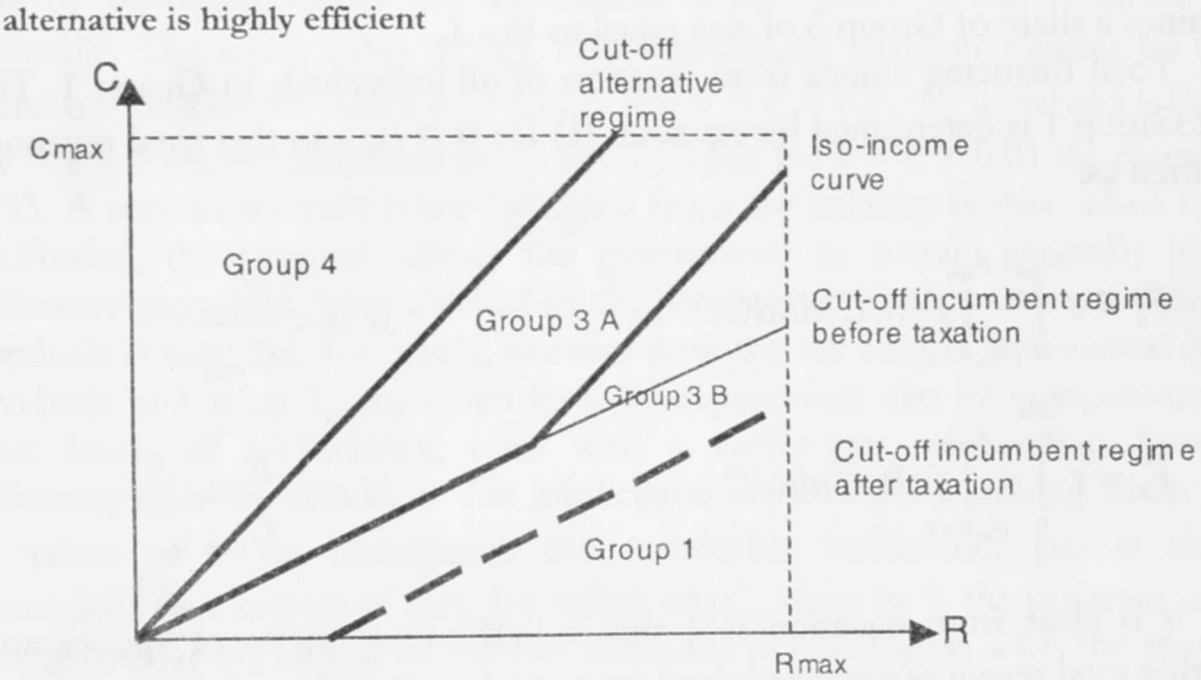
Attracting support from some of the individuals in Group 3.

As an alternative to attracting support from individuals in Group 4, the incumbent can try to maintain support by obtaining consensus among individuals in Group 3. The generic individual in Group 3 supports the incumbent if paid a

transfer of size $\xi_i = R^i - \alpha^e_{alt} C^i + \varepsilon$, where ε is strictly positive. In words, the government must pay a transfer which is equal to the income the individual would receive under the alternative plus a positive amount. This payment should be granted to a share of agents in Group 3 large enough to ensure that, together with full support from Group 4, total consensus for the incumbent meets the majority threshold. Redistributive spending can be financed through taxation on the whole of Group 1.

The proposed program involves some complications. First of all, a necessary condition for the program to be sustainable is that the share of Group 1 is smaller than ½ of total population. As discussed later, the implication is that the program cannot be used in an institutional framework characterized by high efficiency. Second, to reduce total expenditure and hence to maximize the sustainable inefficiency gap, the government must target individuals in Group 3 with low expected income under the alternative. Formally, this requires identifying that iso-income curve $\tilde{I}$ which partition Group 3 into two sub-groups such that the sub-group to the left of $\tilde{I}$ (that is, the sub-group of individuals with income smaller than $\tilde{I}$) added to Group 4 yields a total consensus share of ½. Figure 7 represents the distribution of the population under the proposed program.

Figure 7: Groups partition under redistributive program to target Group 3 when the alternative is highly efficient



Note to Figure 7: Groups labeling refers to post-taxation and post-prgram implementation. Group 3 is partitioned in A and B. Group 3 A supports the incumbent, Group 3 B supports the alternative.

Total expenditure under the program is given by:

(14)

$$G_3 = vS_4 + \int_0^{\frac{\tilde{I}}{\Delta\alpha}\alpha_{inc}C}\int_0 \xi_i f(R,C)dRdC - \int_0^{\frac{\tilde{I}}{\Delta\alpha}\alpha^e_{alt}C}\int_0 \xi_i f(R,C)dRdC + \int_{\frac{\tilde{I}}{\Delta\alpha}}^{C_{\max}\alpha^e_{alt}C+\tilde{I}}\int_{\alpha^e_{alt}C} \xi_i f(R,C)dRdC \qquad \text{if } \frac{R_{\max}}{C_{\max}} \geq \alpha^e_{alt}$$

$$G_3 = vS_4 + \int_0^{\frac{\tilde{I}}{\Delta\alpha}\frac{\alpha_{inc}}{\alpha^e_{alt}}}\int_{\alpha^e_{alt}C}^{\frac{\tilde{I}\alpha_{inc}}{\Delta\alpha}} \xi_i f(R,C)dRdC - \int_0^{\frac{\tilde{I}}{\Delta\alpha}\frac{\alpha_{inc}}{\alpha^e_{alt}}-\frac{\tilde{I}}{\alpha^e_{alt}}}\int_{\alpha^e_{alt}C+\tilde{I}}^{\frac{\tilde{I}\alpha_{inc}}{\Delta\alpha}} \xi_i f(R,C)dRdC + \int_{\alpha^e_{alt}C}^{\alpha^e_{alt}C+\tilde{I}}\int_{\frac{\tilde{I}\alpha_{inc}}{\Delta\alpha}}^{R_{\max}} \xi_i f(R,C)dRdC \qquad \text{if } \frac{R_{\max}}{C_{\max}} < \alpha^e_{alt}$$

where $\Delta\alpha$ denotes the inefficiency gap α_{inc} - α^e_{alt}, S_4 is defined as in equation (11) and $\tilde{I}$ is such that the corresponding iso-income curve $C = (R - \tilde{I})/\alpha^e_{alt}$ determines a share of Group 3 of size equal to ½ - S_4.

Total financing comes from taxation of all individuals in Group 1. The size of Group 1 is determined by equation (1) for $\alpha = \alpha_{inc}$. so that total revenues are written as:

(15)

$$F_3 = \tau \int_0^{C_{\max}}\int_{\alpha_{inc}C+\tau}^{R_{\max}} f(R,C)dRdC \qquad \text{if } \alpha < \frac{R_{\max}}{C_{\max}}$$

$$F_3 = \tau \int_0^{\frac{R_{\max}}{\alpha_{inc}}}\int_{\alpha_{inc}C+\tau}^{R_{\max}} f(R,C)dRdC \qquad \text{if } \alpha \geq \frac{R_{\max}}{C_{\max}}$$

Again, it is clear from equation (15) that a Laffer-type argument applies and hence that total revenues are maximized for some interior value of τ.

As for the previous cases, the maximum sustainable inefficiency gap is constrained by the balanced budget constraint $F_3 = G_3$. More inefficient institutions under the incumbent government reduce total revenues. Interestingly, the effect of greater α_{inc} on total expenditure is likely to be small. Two factors are responsible for that. First, with α^e_{alt} constant, the size of Group 4 does not change and hence the share of individuals in Group 3 that need to be attracted to meet the majority threshold does not change. Second, the individuals flowing

from Group 1 to Group 3 are mostly those with higher expected income under the incumbent and therefore they are not targeted by the program. The size of expenditures is instead significantly affected by changes in α^{e}_{alt} . The more efficient institutions are expected to be under the alternative, the smaller the size of Group 4 and hence the greater $\tilde{I}$. This in turn implies that: (i) a larger share of individuals in Group 3 is to be paid a transfer, (ii) the average size of the transfer is larger. Both effects work in the sense of increasing the expenditure side of the budget.

Simulations of the balanced budget constrain under the assumption of uniform distributions are reported in Table A3 in Appendix 3. The Table reports information analogous to that displayed in Table 2. The exogenous parameter are again α^{e}_{alt} , ν and ε. The value $\tilde{I}$ necessary to ensure a ½ support for the incumbent, the revenue maximizing level of taxation (τ^{*}) and the maximum sustainable level of α_{inc} are all determined endogenously. A first important result is that for relatively low values of α^{e}_{alt} the program cannot be implemented. The reason is that as α^{e}_{alt} gets smaller, total expenditure raises to a level which can be financed through taxation only for values of α_{inc} smaller than one. But, when $\alpha_{inc} < 1$, more than ½ of total population is in Group 1 and hence, even if attracting the whole of Group 3, the incumbent would not receive enough support to maintain office. In other words, the need to balance the budget would require levels of efficiency under the incumbent which make it the program not sustainable. The exact value of α^{e}_{alt} below which the program cannot be used depend on the chosen values of ν and ε. For $\nu = \varepsilon = 0.1$, the threshold is 0.825, for $\nu = \varepsilon = 0.05$, the threshold drops to 0.615 and for $\nu = \varepsilon = 0.01$ the threshold is 0.53. A second relevant point emerging from the exercise is that, when it can be afforded, the program allows the government to sustain generally higher inefficiency gaps than those allowed by the program in which a share of Group 1 individuals is targeted. Intuitively, because now the tax-base is represented by all individuals in Group 1, any given level of expenditure can be compensated at higher levels of inefficiency, even with a Laffer-type relationship between inefficiency and tax revenues. The implication is particularly striking when very low values of ν are considered: the sustainable inefficiency gap is almost unbounded. As a matter of fact, for values of α^{e}_{alt} close to 1, the program under investigation is very similar to the one discussed in Subsection 2.4.1: the share of Group 3 to be attracted is negligible and the bulk of support (and expenditure) comes from targeting Group 4. The maximum affordable inefficiency gaps in the two cases are indeed of the same order.

Discussion

A crucial question concerns the sensitivity of results to the design of redistribution programs. In this respect, one might wonder whether the maximum sustainable inefficiency gap could be further increased under a

program where no transfer is paid to Group 4 and additional support is obtained from some combination of Group 3 and Group 1 individuals. Experimenting with uniform distributions shows that this is unlikely to be the case (simulations are available upon request). The intuition is that obtaining support from Group 4 is generally cheaper than obtaining support from any other group. For this reason, the government has always an incentive to target Group 4. An alternative could be to pay the transfer only to some of the individuals in Group 4, exploiting the fact that one half of the remaining individuals in that group would nevertheless support the incumbent. In that case, some slight gains in terms of maximum sustainable inefficiency are obtained under both programs, but they appear to be in the order of few percent points. For instance, in the case of the program where Group 1 is targeted together with Group 4, paying ν to a share $\gamma < 1$ (where γ is determined endogenously to maximize the inefficiency gap) of Group 4 individuals increases the inefficiency gap of 3 % to 10%, depending on the values of ν and ε, relative to the case where the transfer is paid to everybody. A further proposal could be that of paying ν only to that half of Group 4 individuals that would otherwise not support the incumbent. Here the impact on the inefficiency gap is greater. Taking again the above example, the gap grows by 15% to 55%. However, a problem is that individuals in Group 4 determine their support by tossing a coin. Therefore, the implementation of that program would require the government to be able to predict, for each individual in the group, the outcome of the random experiment. This appears to be a very strong assumption.

A related issue is the one of the information set that must be available to the government for actually implementing the proposed programs. The assumption so far maintained is that the government can observe the pair (R_i, C_i) for each individual. The government is also assumed to share with the public the expectation about the level of inefficiency under the alternative regime. Introducing asymmetric information in the model would clearly reduce the maximum inefficiency gap affordable by the government. This is because it would become difficult to target the redistributive transfers exactly. Again, one can gain some insights of how results change by experimenting with uniform distributions. Consider the program where Group 1 individuals are targeted together with Group 4. Let s denote the share of individuals in Group 1 that are needed to reach the majority threshold. Let C_s be the lowest possible value of C such that a number of Group 1 individuals corresponding to exactly s support the incumbent if paid the transfer $\upsilon = (\alpha_{inc} - \alpha^e_{alt})C_s + \varepsilon$. The government can thus advertise that a limited number of payments of size υ are available to the first s applicants from those who are currently participating. Since the offered transfer is set so to attract the individual with cost C_s, all individuals with smaller cost will also apply and by construction this implies that a share s of Group 1 members receive the transfer. The resulting consensus, coupled with the support stemming from the whole of Group 4, is large enough to remain in office. Simulations in this case show that the maximum inefficiency gap is reduced, at any level of ν

and ε, by a factor between 35% and 75%. The reason, as already pointed out, is that the inability to observe individual costs forces the government to pay a higher than strictly necessary transfer to some individuals in Group 1. The decrease in the maximum inefficiency gap is even greater in the case of the program where Group 3 individuals are targeted. In fact, in that case, the threshold values of α^{c}_{alt} below which the program cannot be implemented rise significantly, thus limiting the scope for the use of that program. An interesting avenue of future research would further explore the design of redistributive policies under asymmetric information. The objective of that research could be the identification of programs that generate separating equilibria, thus inducing individuals in the population to self-reveal their own type.

2.5 Wrap up of the theoretical argument

Institutional inefficiency is modeled as an extra-cost that all individuals have to pay when deciding to undertake an investment project. As institutions become more inefficient, the number of those who decide to participate decreases and the distribution of income in the economy gets more unequal. However, increasing inequality reduces the support for the incumbent regime, thus putting at risk its survival in office. Redistributive fiscal policy can then be used to compensate the adverse effects of higher inequality on political consensus. Three fiscal programs have been discussed. In general, the expected degree of inefficiency under the alternative regime constraints the degree of inefficiency under the incumbent. The exact size of the maximum sustainable inefficiency gap will depend upon the specific design of the redistribution program and upon the values chosen for some exogenous model parameters. All the three proposed programs, however, work in the sense of reducing income inequality by granting positive payments to (at least some of) those individuals that would otherwise earn a zero income and by taxing those who earn positive income.

The analysis generates some predictions that can be tested empirically. First, there is a positive correlation between inefficiency and income inequality. However, the relationship might be non-linear. As inefficiency increases, the reduction in political consensus will induce the government to introduce redistributive fiscal policies. As a consequence of that, at sufficiently low levels of institutional quality, inequality might actually decrease. Second, the average income of the poor (defined as the bottom quintiles of income distribution) is adversely affected by increasing inefficiency. The same is true for average income in the economy. However, the introduction of redistribution plans can again imply non-linearities in the income-inefficiency relationship. Moreover, even though not explicitly constructed as a growth model, the framework does imply a negative effect of bad institutions on per-capita income growth. Third, the survival in office of the incumbent regime is negatively affected by income inequality, and hence by the degree of institutional inefficiency. Conversely, redistributive fiscal policy is associated with greater office tenure. Fourth, the design of fiscal policy is

affected by the degree of institutional inefficiency. High levels of inefficiency induce more redistributive policies, at least in countries where the government has some office-motivation. Furthermore, as highlighted by the simulations, higher levels of redistributive taxation are associated with either very high or very low levels of inefficiency. That is, the relationship between taxation and inefficiency is U shaped. In Section 3 of the paper we propose an econometric analysis of these predictions.

3. Econometric analysis

In this section we provide and econometric investigation of the links outlined in the theoretical framework of Section 2. More specifically, based on the predictions of the model, we focus on the impact of institutional quality on:

(i) income distribution,
(ii) income levels and growth
(iii) redistributive components of fiscal spending.[9]

The type of econometric analysis we have in mind involves two major issues. One is the problem of how to measure institutional inefficiency empirically. The other concerns the choice of the appropriate econometric framework to be employed. Below, we discuss both of these issues separately. We then turn to the presentation of the evidence.

3.1 Empirical measures of institutional inefficiency

The empirical literature in this area has typically made use of subjective indicators to measure the efficiency of institutions, the quality of governance or the extent of corruption (see, for instance Mauro, 1995 and 1997; Keefer and Knack, 1995; Easterly and Levine, 1997; Gupta et al. 1998; Easterly 2000; Rajkumar and Swaroop, 2002). In fact, over the past few years, the increase in the volume of the research devoted to those issues has been accompanied by the proliferation of databases generally available from different sources. These databases differ in terms of the specific institutional dimension assessed, of the methodology used for the collection and the aggregation of raw information, of their coverage both across countries and over time.

In performing our analysis, we decide to take a pragmatic approach. While we estimate our econometric models using one specific database, we check for the sensitivity of results by re-running the regressions with other databases. In particular, the data provided by Kaufmann et al. (1999a,b) will be our reference

[9] The model also involves a correlation between government stability and institutional inefficiency (or income distribution). Empirical testing of such a relationship will be the focus of future research.

source. This database covers a cross-section of 150 countries and contains over 300 indicators compiled from a variety of source. Its key advantage is that it explicitly assesses crucial institutional dimensions that fit well with the general notion of inefficiency underlying our theoretical framework. Its main limitation is perhaps represented by the short time spell covered. In fact, as often argued in the literature, inefficiency is highly persistent over time. This in turn implies that, to some extent, one can effectively extend the time frame of its empirical analysis beyond the coverage of the dataset. Moreover, the predictions obtained from the model in Section 2 can well be tested against the cross-sectional dimension of the dataset, even with a very short time-dimension. However, some of the other datasets that are employed for the sensitivity analysis do have longer time coverage.

The dataset and the procedure followed for its construction are spelled out in details in the original references (Kaufman et al, 1999a,b) and the subsequent updates (Kaufman et al. 2002). In a nutshell, the indicators are grouped into six clusters, each pertaining to a basic aspect of governance and institutions. We will make reference to four of these clusters. "Government effectiveness" measures institutional quality in terms of the efficiency of the bureaucracy and of the civil service. It also reflects the credibility of the government's commitment to policies. "Regulatory burden" instead refers to extra-costs (monetary and non-monetary) that economic agents must pay as a consequence of market-unfriendly procedures, inadequate bank supervision, cumbersome legislation. "Rule of law" reflects various items concerning the effectiveness of the rules of society, including the effectiveness and predictability of the judiciary and the enforceability of contracts. "Grafts" measures inefficiencies in the form of corruption. Table A4 contains some summary statistics for each cluster.

The use of subjective indicators involves some methodological issues. Because they reflect perceptions of individuals (collected, for instance, from questionnaires and experts' surveys) they are likely to be endogenous to the economic performance of the country: better economic conditions will be reflected in a more positive assessment of institutions. Moreover, the speed at which individuals adjust their perceptions has been documented to be very slow. Thus, subjective indicators will overestimate the persistence of institutional quality over time (Annet, 2002 and Carmignani, 2003 provide lengthier discussion of those issues). It would be therefore desirable to provide evidence based also on objective measures of efficiency. To this purpose, we follow the approach suggested by Clague et al. (1999) and proxy efficiency by one minus the ratio of currency in circulation to M2. The underlying intuition is that with good institutions and governance, property rights are sufficiently secure and hence individuals are willing to hold liquid assets via financial intermediaries. Again, the use of this objective indicators will be important in assessing the robustness of results obtained with subjective indicators. It will also permit the application of estimators based on first-differences of income and growth equations, which is

instead normally not feasible with subjective indicators because of their limited time-variance.

3.2 Econometric framework for the analysis of economic effects of institutions

The impact of institutional inefficiency on income distribution, income levels and fiscal policy will be assessed through instrumental variables estimation of a parsimonious specification. Such a specification however may be too restrictive as a growth regression. Therefore, the growth impact of institutions will be estimated within the context of a GMM estimator.

<u>Instrumental variables estimation of a parsimonious specification</u>

Following Hall and Jones (1999) and Kaufman et al. (1999a), consider the following simple econometric model:

$$(16) \quad y_j = \beta_0 + \beta_1 q^*_j + e_j$$

where y is the economic outcome, q^* is the true level of institutional quality, e is the error term, βs are the parameters to be estimated and j denotes a generic country in the sample.

Estimation of equation (16) by OLS is inappropriate for several reasons: endogeneity of y and q^*, omitted variables and measurement errors. Efficient estimates of model parameters can then be obtained through instrumental variables (IV) as follows. First, a model is specified to identify the determinants of q^*:

$$(17) \quad q^*_j = \gamma_0 + \gamma_1 y_j + \gamma'_2 X_j + v_j$$

where X denotes a vector of observable determinants of q and v is a zero mean error term. Then, to account for errors in the measurement of institutional quality, the term q^* in equation (16) is replaced by q_j - u_j, where q_j is an indicator of institutional quality and u_j is a zero-mean distrubance. The assumption is thus that true quality q^* differs from measured quality q because of a randomly distributed noise. The resulting specification is:

$$(18) \quad y_j = \beta_0 + \beta_1 q_j + (e_j - \beta_1 u_j)$$

Under the testable assumptions that $E[X_j e_j] = 0$ and $E[X_j u_j] = 0$, the elements in X are valid instruments for q_j. Equation (18) can therefore be estimated through a standard an instrumental variable (IV) procedure. Following the results in La Porta et al. (1999) and Alesina et al. (2003), an index of ethno-linguistic fractionalization will be used as instrument for institutional quality.

Equation (18) will be estimated to test the predictions on how institutional inefficiency influences income distribution, income levels, and fiscal policy. For income inequality additional evidence will be generated from a richer specification that includes a variety of control variables on the r.h.s. of the regression model.

GMM estimation of growth regressions

The regression model that is used for the empirical analysis of economic growth is written as:

$$(19) \quad y_{jt} - y_{jt-1} = \beta_0 + \beta_1 y_{jt-1} + \beta_2 'W_{jt} + \mu$$

where now y denotes the log of per-capita GDP, W is a vector of determinants of economic growth including proxies for institutional inefficiency and μ consists of a country-specific individual effect η_j, of a time-specific effect κ_t and of a purely random component ζ_{jt}. The initial level of per-capita GDP (y_{jt-1}) is included on the r.h.s. to account for the hypothesis of conditional convergence. Equation (19) can be re-written as:

$$\textbf{(20)} \quad y_{jt} = \beta_0 + (1+\beta_1) y_{jt-1} + \beta_2 'W_{jt} + \mu$$

Therefore, estimating (19) is equivalent to estimating a dynamic equation with a lagged-dependent variable.

Cross-section estimation of (19) involves three major shortcomings. First, because of the dynamics highlighted by equation (20), there is positive correlation between lagged income and the individual effect component in the error term. The consequence is that OLS estimators will be downward biased. Second, if not all determinants of growth are represented in vector W, then the error term will reflect the effect of these omitted variables. To the extent that these are correlated with any of the included variables, further bias of standard least square estimators is generated. Third, some of the elements in vector W are likely to be endogenous to growth (or income). Panel estimation of (19) allows to address this latter shortcoming. In fact, in a panel framework, lagged values of potentially endogenous variables can be used as instruments in GLS (or 2 step least squares) estimation. However, that will not eliminate bias due to correlated individual effects and omitted variables.

One way to address these issues is proposed by Caselli et al. (1996), who apply the generalized method of moments (GMM) originally developed by Holtz-Eakin et al. (1988) and Arellano and Bond (1991). To eliminate the country-specific effect, they take first differences of (20):

(21)

$$y_{jt} - y_{jt-1} = (1+\beta_1)(y_{jt-1} - y_{jt-2}) + \beta_2(W_{jt} - W_{jt-1}) + (\kappa_t - \kappa_{t-1}) + (\zeta_t - \zeta_{t-1})$$

Equation (21) cannot still be estimated by OLS. In fact, the joint endogeneity problem is not removed and there is non-zero correlation between the lagged dependent variable and the composed error term. For these reasons, instrumental variables must be used. Under the identifying assumptions that $E[\zeta_{jt}\zeta_{jt-1}] = 0$ and that the elements in W are predetermined[10], past values of explanatory variables can be used as instruments. Thus, the GMM approach consists in regressing growth on lagged growth and first differences of pre-determined explanatory variables, using lagged values of r.h.s. variables for IV estimation.

The first-difference GMM estimator above described has been applied quite extensively in the literature (Benhabib and Spiegel, 1997 and 2000; Easterly et al. 1997; Forbes 2000; Levine et al. 2000). However, Bond and Blundell (1998) document that in large finite sample, weak instruments provide biased estimates. The implication is that the first-differenced GMM estimator is poorly behaved in panel models with short and persistent time series, as it is often the case in growth analysis. Bond et al. (2001) therefore propose to estimate equation (20) and equation (21) as a system of simultaneous equations, using lagged first-differences of y and W as instruments in equation (20) and lagged levels of y and W as instruments in equation (21). A Sargan test of overidentifying restrictions can be applied to assess the validity of the instruments. Bond et al. (2001) and Hoeffler (2002) report evidence to show the efficiency gains obtained with this alternative system GMM estimator in growth regressions with panel data. In the rest of the paper, the expression GMM estimator will refer the system GMM estimator, unless otherwise specified

In the context of our econometric analysis, the application of GMM estimators (in either the two versions just discussed) is seriously constrained by the fact that indicators of institutional efficiency are generally characterized by very limited time-variability. In that case, taking first differences would remove the effect of institutions, thus making it impossible to test the theoretical predictions generated by the model in Section 2. We therefore follow Dollar and Kraay (1999b) and measure inefficiency by one minus the ratio of currency in circulation to M2 (as originally proposed by Clague et al. 1999).

[10] Flow elements of W_{jt-1} must be predetermined for ζ_{jt+1}, while stock elements of W_{jt-1} must be predetermined for ζ_{jt}. See Caselli et al. (1996) for details.

3.3 Econometric results

The data-set for the estimation of the parsimonious specification (18) consists of 49 African countries. For each country, five indicators of institutional quality are considered: Government Effectiveness (EFFECT), Regulatory Burden (BURDEN), Rule of Law (RULEX), Control of Corruption (GRAFT), Ratio of Currency in Circulation to M2 (CURRENCY). The first four are the subjective indicators taken from Kaufmann et al. (1999a,b) mentioned above. The fifth-one is the objective measure taken from Clague et al. (1999). All of these five variables are coded such that higher values denote better institutions. The dependent variables are: the Gini coefficient (GINI), as a measure of income inequality; the level of real per capita GDP (GDP p.c.) as a measure of income levels in the economy; the annual change in Government Consumption to GDP ratio (Gov. Cons.), as an indicator of the extent of redistribution. Sources of these variables are given in Appendix 2.

Equation (18) is estimated as a cross-section, with indicators of institutional quality instrumented by an index of Ethnic Fractionalization taken from Alesina et al (2003). Data are averaged over the five year period 1995-2000. Bilateral correlations between pairs of institutional indicators are generally positive and statistically different from zero, even though they are statistically smaller than one. This suggests that while the indicators do measure different dimensions of inefficiency, including all of them contemporaneously on the r.h.s. of equation (18) might add a problem of multicollinearity. Therefore, one regression for each indicator is estimated over the entire sample. When required, standard errors are corrected for heteroscedasticity.

The first three columns of Table A5 (Appendix 3) summarize the results from the instrumental variables procedure (the estimated constant term is omitted from the table). To interpret the results consider that the theoretical model would predict that the estimated coefficient on institutional measures are negative when the dependent variables are GINI and government consumption and positive when the dependent variable is the level of income. The data support those predictions, even though some of the estimated coefficients occasionally do not pass a zero restriction test. Thus, there is evidence that when institutions become less efficient, the degree of inequality of income distribution increases, fiscal policy tends to be more redistributive and the average income level in the economy drops. Rule of Law and Control of Corruption are the two dimensions of institutional quality that statistically appear to matter the most.

The growth regression is estimated on a panel including annual observations taken over the period 1980-2000. Because of lack of time-series data on subjective indicators of efficiency, the GMM estimator can be applied only using CURRENCY as the institutional variable. Control variables include the lagged level of per capita GDP, the lagged level of average years of schooling, the

international trade to GDP ratio and the black market premium. The estimated coefficient on CURRENCY is reported in the fourth column of Table A5. As it can be seen, this coefficient is positive (0.759) and statistically different from zero, suggesting that institutional inefficiency is harmful for economic growth. The robustness of this result to changes in the specification of the growth regression is discussed below. Finally, as a point of reference, the last column of Table A5 reports for the four subjective indicators of inefficiency the coefficient estimated from the instrumental variables procedure. All of them are consistent with the results generated by the GMM estimator.

3.4 Sensitivity checks and extension of the econometric analysis

The results on the impact of institutions on income distribution survive when less parsimonious specifications are estimated. The coefficient on RULEX and GRAFT remains negative and statistically significant when the set of explanatory variables is extended to include: (i) the level of per-capita GDP (both linear and squared to account for the Kuznets' hypothesis), (ii) indicators of inequality in the distribution of education and physical capital, (iii) dummy variables to capture cross-country differences in terms of religion and degree of democracy (see Gradstein et al. 2000).

Similarly, the result on CURRENCY in the growth regressions is qualitatively unchanged when the set of control variables is modified with the inclusion of inflation, rate of population growth, index of democracy and religion dummies. Moreover, the application of the Caselli et al.'s version of the GMM estimator does not produce any substantive change, with CURRENCY still positively correlated to growth. Finally, using five-year averages, rather than annual observations, over the sample periods 1980-2000 and 1975-2000 again does not modify the results on institutions.

A possibility incorporated into the theoretical model is that institutional inefficiency might have non-liner effects, especially in terms of income distribution. To account for that, all the regressions with GINI as the dependent variable have been re-estimated introducing the squared value of institutional variables besides the linear term. In such a way it is possible to capture U and inverted U shaped relationships. For the variable RULEX the linear and the squared terms are statistically different from zero and their signs suggest that income distribution decreases at very high levels of inefficiency. However, the results is not reproduced for the other indicators. To gain further insights on the form of the relationship, we conduct a Ramsey test of linear vs. non linear specification for both the GINI regression and the growth regression. In the two cases the test favors the liner specification.

Future research should extend the econometric analysis. In particular, it would be important to use larger samples, as data availability somehow constrains the type of analysis that can be done for the African group. First, with data on the average income of the poor, one can construct measure of income inequality that can be used in place of the GINI coefficient. Second, changes in government consumption are a very crude proxy for the degree of income redistribution in the economy. Ideally, one should look at how institutional variables affect spending components such as social welfare and security, housing and health. Disaggregated data of this type are available only for a few African countries. Hence the need to have other developing countries in the sample. Third, the issue of non-linearity could be investigated by splitting the sample on the basis of inefficiency levels and estimate separate regressions. But this require the full sample to include much more than 49 countries. Fourth, the implications of institutional inefficiency on government stability have not been investigated here, but they constitute an important part of the theory and hence will deserve attention in the future.

4. Conclusions and the way forward

The model predicts that institutional inefficiency increases the degree of income inequality and hampers growth prospects. This in turn reduces the support for the incumbent government and threatens its survival in office. As a response the government will either start institutional reforms or introduce fiscal policy measures aimed at redistributing income from the rich to the poor (eventually a combination of reforms and redistribution could be figured out). Those predictions find support in the empirical evidence generated from a panel of African countries.

A few directions of future research can be identified. First, the theoretical model can be further defined to account for separating equilibria in the description of groups formation. A related line of investigation would consider the possibility that the distribution of investment opportunities in the economy is not known with certainty. Second, the analytical set-up is essentially oriented at the analysis of income distribution. Still it does yield predictions in terms of income levels and growth. The growth-framework however can be reinforced and expanded to study the different implications of inefficiencies for different types of investment (i.e. investment in education, in physical capital, business enterprises, etc..). Third, data constraints limit the scope of the empirical analysis. A few directions to extent the econometric analysis have been suggested at the end of Section 3 and we do not need to repeat them now. We only stress the importance of enlarging the sample also to non-African economies. Finally, in considering the degree of redistribution of fiscal policy one should also look at the revenue side, rather than just at the expenditure side. Again, this will require disaggregated data on a larger sample of countries.

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Appendix A1. A formalization of the dynamic pattern of institutional reforms.

Reforming institutions to improve their quality and efficiency is an option that the government can exploit when increasing income inequality poses a challenge to its survival in office. In this Appendix we provide a preliminary theoretical investigation of the dynamic pattern of institutional efficiency that results from the implementation of reforms in the context of the model of Section 2.

The basic idea is as follows. Reforms are costly and the cost is a function of the "size" of each reform. However, in the absence of reforms, institutions deteriorate at a given rate, so that at some point in time inefficiency will achieve the level above which a sufficient consensus for government survival no longer exists. The government thus chooses size, and timing, of reforms so to minimize an expected cost function over a fixed time horizon *T*. In fact, the problem is analogous to that faced by a monopolist who optimally sets the price in the presence of constant inflation and small menu costs (Barro, 1972; Sheshinski and Weiss, 1977 and 1982). The solution therefore follows the approach taken by the literature on optimal price adjustment.

In developing the analytical framework, we make the following simplifying assumptions. First, the growth rate of inefficiency is positive, exogenously given and constant. Empirically, one might expects this rate to be small enough to yield high persistency of institutional quality over time. In any case, the assumption reflects a worst case scenario, where reforms are the only mean to promote and maintain efficiency. That is, we rule out the case where institutions are self-improving. Second, a reform determines an immediate reduction of inefficiency to a chosen level α^*. Thus, the outcome of the reform is produced without lags and it is by no mean stochastic. These are clearly oversimplifications that can be removed in future work. Third, the time horizon of the government is fixed and equal to *T*. This assumption is meant to reflect the fact that stochastic events can at any time terminate the executive, independently from its institutional and economic performance.

Basic set-up

Let α_{surv} denote the level of inefficiency above which the government looses the majority consensus. This α_{surv} will be equal to α^{e}_{alt} if the government does not use fiscal policy redistribution or to the maximum sustainable α_{inc} if redistributive programs are implemented. Also, denote by α_t the level of inefficiency at time *t*. Inefficiency grows at a continuous rate ρ ($\rho > 0$), so that taken an initial value α_0, we have $\alpha_t = \alpha_0 e^{\rho t}$. Finally, let α^* be the level at which inefficiency drops as a consequence of the reform intervention. This is chosen endogenously by the government. The size of a given reform intervention is then $\Delta = \alpha_t - \alpha^*$. Given a time horizon T, the government will minimize the expected total cost of all reform interventions:

$$\text{(A1)} \quad E\left(\frac{Cost}{Time}\right) = f(\Delta,\gamma)E(n/T)$$

where $f(\cdot)$ is a generic function to be specified below and such that $\partial f(\cdot)/\partial\Delta \geq 0$, γ is an exogenous, strictly positive, parameter and $E(n/T)$ denotes the expected number of reform interventions over the time horizon T. Thus, function (A1) simply expresses expected total cost as the cost of a reform intervention times the expected number of interventions.

As discussed for instance by Barro (1972), $E(n/T)$ approaches the inverse of the time between two consecutive reforms as T becomes large. The time between two reforms in turn is determined as the time required for inefficiency to grow by a given amount Δ. This is equal to $(\ln\delta)/\rho$, where $\delta \equiv (\Delta+\alpha_0)/\alpha_0$ and α_0 is taken to be a generic starting value of inefficiency. Substitution into (A1) yields:

$$\text{(A2)} \quad E\left(\frac{Cost}{Time}\right) = f(\Delta,\gamma)\frac{\rho}{\ln\delta}$$

Equation (A2) incorporates a basic trade-off. Larger reforms imply a greater cost for each intervention, but a smaller expected number of interventions. On the other hand, the smaller the size of each individual reform, the larger the expected number. The problem for the government is to determine Δ and α^* optimally, given this trade-off and taking into account that at no point in time α_t can be higher than α_{surv}. It is intuitively clear that the solution will depend upon the specific function form chosen for f. Below we consider three different possibilities, yielding different patterns [11].

A linear cost function

To start with, consider the following linear specification:

$$\text{(A3)} \quad E\left(\frac{Cost}{Time}\right) = \gamma(\alpha_t - \alpha_0)\frac{\rho}{\ln\delta}$$

The first derivative of (A3) w.r.t. Δ is:

[11] Note that if expected cost does not depend on the size of the reform, but is constant, then the solution of the problem is trivial: the government will maximize the size of each reform, so to reduce the total number of reforms over the given time horizon.

$$\text{(A4)} \quad \frac{\partial E(\cdot)}{\partial \Delta} = \gamma \frac{\rho}{\ln \delta} + \gamma \left[-\frac{\rho}{(\ln \Delta)(\Delta + \alpha_0)} \right]$$

Simulations show that it is always positive and hence that the expected cost is decreasing in the size of the reform. The implication is that the government will chose to set $\Delta^* = 0 + \phi$ (where ϕ is a small positive constant), since for $\Delta = 0$ the cost function is not defined. In other words, the optimal policy is to implement a continuous sequence of extremely small reforms, thus keeping the level of inefficiency almost constant.

To complete the solution of the problem, the level at which institution is to be kept constant must be determined. First of all notice that expected costs decrease as α_0 decreases. This might suggest that α^* must be set at the minimum possible level of α, α_{min}.[12] However, one has to take into account the cost of the initial reform, that is the cost of lowering inefficiency from the level α_t that is inherited from the previous government to α_{min}. If the gap between inherited inefficiency and minimum inefficiency is sufficiently large, then the optimal value α^* can be greater than α_{min}. Simulations show that with α_{min} equal to 0.01, $\alpha^* = \alpha_{min}$ remains the optimal solution for values of inherited inefficiency up to 1. Results are robust to changes in values of ρ and γ.

The resulting pattern of reforms and inefficiency can thus be summarized as follows. Immediately after taking office, the government will introduce a reform to lower inefficiency up to α^*. For sufficiently low values of inherited inefficiency, this α^* will coincide with the minimum possible level of inefficiency. Subsequently, the government, for the whole of its tenure, will implement an almost continuous sequence of small reforms, so that inefficiency will be kept substantially constant at α^*. Empirically, this suggests that inefficiency will display high persistence (independently from the value chosen for ρ), with occasional large shifts.

<u>An exponential cost function</u>

Consider now the exponential cost function:

$$\text{(A5)} \quad E\left(\frac{Cost}{Time}\right) = \gamma^{(\alpha_t - \alpha_0)} \frac{\rho}{\ln \delta}$$

The derivative w.r.t. Δ cannot be signed unambiguously:

$$\text{(A6)} \quad \frac{\partial E(\cdot)}{\partial \Delta} = \gamma^{\Delta - 1} g \left\{ \frac{\Delta g}{\ln g} - \frac{\gamma g}{(\Delta + \alpha_0)(\ln \delta)^2} \right\}$$

[12] Technically, α_{min} must be strictly positive, even though it can tend to zero.

where recall that Δ denotes the size of the reform (α_t - α_0).

The two key parameters determining the behavior of (A5) turns out to be γ and Δ. For a broad range of values of these two variables, the partial derivative (A6) is negative and hence the cost function is minimized at the maximum possible value of Δ. This means that the optimal size of the reform is equal to α_{surv} - α_{min}. Therefore, the government will let inefficiency grow up to the point where its consensus drops at the minimum sustainable level and subsequently it introduces a reform to restore the possible maximum level of efficiency. The resulting pattern is one of cycles of inefficiency, with reforms of large size that occur at relatively long, albeit regular, distance. However, for $\gamma > 1$ and $\Delta < 1$, the cost function is a parabola with minimum located at some value of Δ between 0 and 1. In that case, the cycles that characterize the pattern of inefficiency and reforms have higher frequency and display less pronounced peaks.

A mixed linear function

As a possible intermediate case between the two just discussed, consider a cost function that has both a linear and an exponential component:

$$\text{(A7)} \quad E\left(\frac{Cost}{Time}\right) = \gamma^{\frac{1}{\alpha_0}}(\alpha_t - \alpha_0)\frac{\rho}{\ln\delta}$$

With specification (A7), the cost of the reform increases, given the size of the reform, the lower the value at which inefficiency drops as a consequence of the implementation of the reform itself. The intuition is that higher levels of efficiency are more costly to be achieved by any reform.

The linearity in Δ suggests that, as for the case of cost function (A3), total expected cost increases the larger the size of each reform. However, the additional cost components might imply that it is no longer optimal to set $\alpha^* = \alpha_{min}$. Simulations confirm this intuition. The government facing cost function (A7) will choose to minimize Δ by implementing an almost continuous sequence of very small reforms. However, this reforms will be implemented to maintain α exactly at the threshold that guarantees survival to the incumbent. The pattern of inefficiency is similar to that identified under cost function (A3), with the difference that institutional quality is now persistently lower.

Appendix 2. Sources and variables description

EFFECT	Government Effectiveness. Subjective indicator of quality of public service provision, quality of the bureaucracy, competence of civil servants, independence of civil service from political pressure, credibility of government's commitment to given policies. Period: 1995-2000. Source: Kaufmann et al. 1999a,b; Kaufmann et al. 2002
BURDEN	Regulatory Burden. Subjective indicator of incidence of market-unfriendly policies and of burdens imposed by excessive regulation in areas such as foreign trade and business development. Period 1995-2000. Source: Kaufmann et al. 1999a,b; Kaufmann et al. 2002
RULEX	Rule of Law. Subjective indicator of the extent to which agents have confidence in and abide by the rules of society. It includes perceptions of the incidence of both violent and non-violent crime, the effectiveness and predictability of the judiciary and the enforceability of contracts. Period 1995-2000. Source: Kaufmann et al. 1999a,b; Kaufmann et al. 2002
GRAFT	Corruption. Measures the perceptions of corruption in the economy. Period 1995-2000. Source: Kaufmann et al. 1999a,b; Kaufmann et al. 2002
CURRENCY	Objective indicator of institutional efficiency. Defined as 1 – the ratio of currency incirculation to M2. Source: Clague et al. (1999)
ETHNOX	Index of Ethic fractionalisation. Defined as 1 minus the sum of squared ethnic shares in each country. Latest possible observation ('90s) Source: Alesina et al. (2003).
GINI	Gini coefficient of inequality of income distribution. Latest possible observation ('90s) Source: Deinigner and Squire (1996) and UNU-WIDER data-base
GDP p.c.	Real per capita GDP, average 1995-2000. Source: World Bank Africa Data-Base
GROWTH	Average annual growth rate of GDP p.c.
GOV. CONS.	Average annual change in the government consumption to GDP ratio. Period 1995-2000. Source: IMF, Government Financial Statistics.

Additional variables used for growth regression

TRADE	International trade (exports and imports) to GDP ratio. Source: IMF, direction of trade statistics
SCHOOLING	Average number of years of schooling in the adult population. Source (Barro and Lee, 2000)
BLACK MARKET PREMIUM	Indicator computed as: ((Parallel exchange rate/Official exchange rate)-1)*100 Source: Global Development Finance and World Development Indicators

Appendix 3. Tables with simulations and econometric results.

Table A1. Simulations of equation $G_1 = F_1$

(1) ν	(2) G_1 (=F_1)	(3) α^e_{alt}	(4) Max α_{inc}	(5) Max inefficiency gap (%)
0.1	0.05	1	1.47	47
0.05	0.025	1	2.9	190
0.01	0.005	1	14	1300
0.15	0.075	1	Not sustain.	Not sustain
0.133	0.0665	1	1.1	10

Notes to Table A1: Table reports results from the simulation of the balanced budget constraint $G_1 = F_1$, where $G_1 = \nu/2$ and F_1 is given in equation (10) – see text. α^e_{alt} and ν are set exogenously, while Max α_{inc} is determined endogenously under the balanced budget constraint. The maximum inefficiency gap is the difference (in percent) between Max α_{inc} and α^e_{alt}. Column 2 reports the level at which expenditure balance revenues. The maximizing revenues value of taxation is 0.33. "Not sustain." indicates that the program cannot be afforded under balanced budget constraint.

Table A2. Simulations of equation $G_2 = F_2$

(1) ν	(2) ε	(3) α^e_{alt}	(4) $\tilde{c}$	(5) τ^*	(6) G_2 (=F_2)	(7) Max ineff. Gap (%)	(8) Group 1 (%)	(9) Group 1 targeted(%)
0.1	0.1	0.95	0.026	0.32	0.0501	39.5	37.7	6.8
0.1	0.1	0.5	0.277	0.28	0.0564	38.2	65.4	38.2
0.1	0.1	0.1	0.489	0.38	0.0738	222	83.9	53.7
0.05	0.05	0.95	0.026	0.31	0.0254	150.2	21	12
0.05	0.05	0.5	0.285	0.22	0.0369	69.8	57.5	43.5
0.05	0.05	0.1	0.293	0.35	0.0591	313	79.3	56.8
0.01	0.01	0.95	0.028	0.26	0.0067	518.2	8.5	30.1
0.01	0.01	0.5	0.503	0.17	0.0222	99.4	50.1	49.9
0.01	0.01	0.1	0.515	0.32	0.0479	389	75.5	59.5

Notes to Table A2: Tables reports simulations of the balanced budget constraint $G_2 = F_2$ (see equations 12 and 13 in the text). ν, ε and α^e_{alt} are set exogenously, while $\tilde{c}$ and τ^* are determined endogenously. The maximum inefficiency gap is equal to the difference between the maximum sustainable α_{inc} (not shown in the Table) under balanced budget constraint and the exogenous

value of α^c_{alt}. Column 6 reports the value at which expenditures balance revenues. Column 8 reports the size of Group 1 in percent of total population. Column 9 reports the share of Group 1 individuals (in percent of total size of Group 1) that are targeted by the redistributive program.

Table A3. Simulations of equation $G_3 = F_3$

(1) ν	(2) ε	(3) α^c_{alt}	(4) $\tilde{I}$	(5) τ^*	(6) $G_2(=F_2)$	(7) Max ineff. gap	(8) Group 3 (%)	(9) Group 3 (targeted)%
0.1	0.1	0.95	0.026	0.33	0.05038	54.7	18.4	13.7
0.1	0.1	0.7	ns	ns	ns	ns	ns	Ns
0.1	0.1	0.5	ns	ns	ns	ns	ns	Ns
0.1	0.1	0.1	ns	ns	ns	ns	ns	Ns
0.05	0.05	0.95	0.026	0.33	0.02538	207.1	35.3	7.3
0.05	0.05	0.7	0.161	0.33	0.03913	170.3	38.6	38.9
0.05	0.05	0.5	ns	ns	ns	ns	ns	Ns
0.05	0.05	0.1	ns	ns	ns	ns	ns	Ns
0.01	0.01	0.95	0.026	0.33	0.00534	1358.5	48.9	5.3
0.01	0.01	0.7	0.154	0.33	0.01721	515	53.4	28.2
0.01	0.01	0.5	ns	ns	ns	ns	ns	Ns
0.01	0.01	0.1	ns	ns	ns	ns	ns	Ns

Notes to Table A3: Tables reports simulations of the balanced budget constraint $G_3 = F_3$ (see equations 14 and 15 in the text). ν, ε and α^c_{alt} are set exogenously, while $\tilde{I}$ and τ^* are determined endogenously. The maximum inefficiency gap is equal to the difference between the maximum sustainable α_{inc} (not shown in the Table) under balanced budget constraint and the exogenous value of α^c_{alt}. Column 6 reports the value at which expenditures balance revenues. Column 8 reports the size of Group 3 in percent of total population. Column 9 reports the share of Group 3 individuals (in percent of total size of Group 1) that are targeted by the redistributive program. ns denotes that the program is not sustainable under balanced budget constraint.

Table A4. Summary Statistics of Indicators of Institutional Quality
(for variables description see Appendix 2)

	Effect	Burden	Rulex	Graft		Effect	Burden	Rulex	Graft
Africa					***Central Europe and former USSR***				
Mean	-0.526	-0.417	-0.507	-0.484	Mean	-0.431	-0.371	-0.272	-0.434
Median	-0.399	-0.218	-0.444	-0.469	Median	-0.576	-0.312	-0.256	-0.557
Min	-1.769	-2.376	-2.153	-1.567	Min	-1.423	-1.931	-1.335	-1.316
Max	0.633	0.572	1.279	0.535	Max	0.674	0.854	0.825	1.023
St.dev.	0.588	0.720	0.719	0.530	St.dev.	0.619	0.816	0.600	0.615
World					***Middle East***				
Mean	-0.014	0.002	0.004	-0.001	Mean	-0.113	-0.194	0.321	-0.124
Median	-0.113	0.183	-0.119	-0.242	Median	-0.063	0.102	0.665	-0.215
Min	-1.883	-3.142	-2.153	-1.567	Min	-1.883	-3.142	-1.844	-1.265
Max	2.082	1.245	1.996	2.129	Max	0.900	0.752	1.269	1.277
St.dev.	0.893	0.830	0.927	0.906	St.dev.	0.735	0.990	0.884	0.698
Latin America and Caribbean					***East and South Asia***				
Mean	-0.104	0.426	-0.234	-0.175	Mean	0.105	0.018	0.102	0.016
Median	-0.221	0.608	-0.392	-0.276	Median	0.010	0.043	-0.059	-0.165
Min	-1.232	-1.133	-1.495	-0.958	Min	-1.461	-1.818	-1.204	-1.096
Max	1.264	1.233	1.086	1.118	Max	2.082	1.245	1.939	1.948
St.dev.	0.623	0.571	0.646	0.595	St.dev.	0.839	0.743	0.903	0.747
Western Europe and High Income OECD Countries									
Mean	1.432	0.901	1.432	1.557					
Median	1.504	0.889	1.549	1.620					
Min	0.560	0.389	0.496	0.672					
Max	2.030	1.206	1.996	2.129					
St.dev.	0.390	0.216	0.381	0.474					

Source: Own Computation from data reported in Kaufmann et al. (1999a,b)
Notes: For each sub-regional groups and each indicator of institutional quality, the following information is reported: mean value (mean), median value (median), minimum (min), maximum (max) and standard deviation (st. dev.).

Table A5. Summary of Econometric Results

	Dependent variables			
	GINI	**GDP p.c.**	**Gov. cons.**	**Growth**
EFFECT	-0.252	4.008(*)	-0.057	0.148(*)
BURDEN	-0.261	5.353	-0.163	0.695
RULEX	-0.092(*)	1.406(*)	-0.018(*)	0.182(*)
GRAFT	-0.051(*)	2.224(*)	-0.032(*)	0.099(*)
CURRENCY	-0.398	5.825(*)	-0.054	0.759(*)

Source: Own Computations. Explanatory notes. The table reports for each indicator of institutional quality (Effect, Burden, Rulex, Graft and Currency; see Appendix 2 for variables description) the estimated coefficient from a regression of each dependent variable. Dependent variables are: the Gini coefficient of income (GINI), the average annual real per capita GDP (GDP p.c.), the average annual change in the government consumption to GDP ratio (Gov. cons.) and the average annual growth rate of per-capita real GDP (Growth). For the first three dependent variables (Gini, GDP p.c. and Gov. Cons.) the estimated coefficients are obtained from Instrumental Variable estimation. For Growth the estimated coefficient is obtained from GMM estimation (see text for details) for Currency and from Instrumental Variables for the other four measures.

(*) denotes that the estimated coefficient is significant at usual confidence levels.