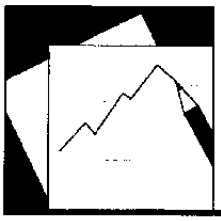
WP/01/86



IMF Working Paper

Resources and Incentives to Reform: A Model and Some Evidence on Sub-Saharan African Countries

Alberto Dalmazzo and Guido de Blasio

INTERNATIONAL MONETARY FUND

WP/01/86

IMF Working Paper

Resources and Incentives to Reform: A Model and Some Evidence on Sub-Saharan African Countries

Prepared by Alberto Dalmazzo and Guido de Blasio[1]

Authorized for distribution by Riccardo Faini

June 2001

Abstract

The paper models the incentives for a self-interested government to implement "good policies". While good policies lead to investment and growth, they reduce the government's ability to increase supporters' consumption. The model predicts that resource abundance is conductive to poor policies and, consequently, to low investment. The implications of the model are broadly supported by evidence on sub-Saharan African countries. In particular, countries that are rich in natural resources tend to have lower institutional quality and worse macroeconomic and trade policies.

JEL Classification Numbers: D72, E22, Q33

Keywords: Investment; autocracy; reforms

Author's E-Mail Address: dalmazzo@unisi.it; gdeblasio@imf.org

---

[1] University of Siena; and Bank of Italy and IMF, respectively. The authors thank Reza Baquir, Tito Cordella, Riccardo Faini and Alessandro Rebucci for very helpful comments, and Stephanie Siciarz for editorial assistance.

Contents Page

I. Introduction 3

II. The Model 5
A. Dictatorial Government 5
B. Government Benevolence and Welfare 13
C. Foreign Aid and Conditionality 16

III. Empirical Evidence 18
A. Theoretical Implications 18
B. Existing Empirical Evidence 19
C. Data Set 21
D. Institutions, Policies, and Economic Activity 22
E. Effects of Resource Abundance 23

IV. Concluding Remarks 26

Tables
1. Institutions, Policies, Infrastructures, and Economic Activity 27
2. Resources and Institutions 28
3. Resources and Policies 29
4. Resources and Infrastructures 30
5. Seemingly Unrelated Regression Estimation 31
6. Results with the Share of Exports of Primary Products 32

Figures
1. The optimal level of Q 33

References 34

Appendices 37

I. INTRODUCTION

Recent literature has attributed the low rates of investment and growth observed for many African countries to a combination of poor infrastructure and bad policies and institutions, such as insufficient economic liberalization, unstable macroeconomic environment, and poor political and legal frameworks (see Easterly and Levine (1997) and Collier and Gunning (1999)). This has been compounded with the view that undemocratic government might face distorted incentives as to implementing reforms and undertaking public investment programs (see, e.g., Ndulu and O'Connell (1999)). At the same time, some studies (Sachs and Warner (1997,1999)) have emphasized the adverse effects of natural resources, while other work has questioned the effectiveness of foreign aid to stimulate economic development in poor countries (Tsikata (1998), Dollar and Easterly (1999)).

The scope of this paper is to provide a simple unifying explanation for these facts, adding at the same time some new evidence. In particular, we consider the incentives to reform for a self-interested government, showing that the availability of resources, such as foreign aid and natural resources, discourages the adoption of "good policies" and eventually hampers investment and growth.

In the simplest version of the model, we focus on the incentives of self-interested governments to take actions that can partly be in the interest of society.[2] We consider a dictatorial government that has two alternatives. It can either choose to keep "bad policies", concentrating on loot-seeking activities that exploit the country's resources, or adopt "good policies", conceding some economic liberalization and implementing public investment in infrastructure, so as to encourage investment and growth. From the government's point of view, the benefits from reforms arise from a *larger* national surplus, which can partly be appropriated by its supporters. However, good policies are costly to such a government, since lower taxation, lower tariffs, less state control on the economy, etc., tend to reduce the fraction of national surplus that the ruling elite can extract. We show that an autocratic government will have less incentive to reform when the country's resources are abundant. This result bears relevant implications for the effects of natural resource shocks and foreign aid, including debt forgiveness, on reform plans. In particular, the ruling elite will react to positive resource shocks by implementing worse policies, in order to increase supporters' consumption[3].

---

[2] See McGuire and Olson (1996)

[3] Since the basic model hinges on a deep divergence of interests between the ruling elite and the rest of society, our approach bears some similarities to agency theories of corporate governance: see Shleifer and Vishny (1997). Without pushing the analogy too far, one can think of the incumbent government as self-interested management that faces dispersed shareholders (the society). However, international institutions may sometimes play the role of "large stakeholders," putting pressure on local governments to implement efficient actions.

The basic model, developed in Section II.A, is generalized in Section II.B to the case when the government has some care for the welfare of the entire society. We show that the higher the benevolence towards society, the higher the incentive to implement good policies. Finally, Section II.C analyzes the implications that international institutions may face when providing aid.

The implications of our model are related to other works. A strand of literature concentrates on the impact of aid and natural resources on growth in countries ruled by elites. Boone (1996) shows that aid is mostly wasted in elitist regimes. Tornell and Lane (1999) argue that windfalls increase the rent-seeking behavior of powerful groups, reducing growth. Under similar assumptions, Svensson (2000a) shows that foreign aid and natural resource shocks tend to reduce the provision of public goods. Differently from ours, these papers do not explicitly analyze the incentive for the incumbent government to implement "good policies". An exception is constituted by Svensson (1998), who develops a model where insecure property rights hamper private investment. By considering the government's incentive to invest in "legal infrastructure," Svensson shows that political instability discourages reforms of the legal system. This model has two main differences from ours. First, it crucially builds on "political risk". Second, although it focuses on the incentives to reform, it is not directly concerned with the role of natural resources, or international aid, on the behavior of governments.

Several papers concentrate on the political effect of reforms. Acemoglu and Robinson (1998,1999) consider the pressure to democratize put by the threat of a revolution upon the ruling elite. By contrast, Robinson (1999) develops a formal model where an autocratic government may avoid supplying public goods, so as to reduce the likelihood of "collective actions", such as revolutions, on behalf of the citizens. Similar arguments are put forward by La Ferrara (1996) and Wantchekon (2000). In particular, Wantchekon argues that authoritarian governments use resource windfalls to "buy off" potential opponents and strengthen their power. These papers rely on different, and often opposite, assumptions about the relation between political support and reforms. By contrast, we show that our results of our model hold independently of whether good policies increase or reduce political consensus for the incumbent government.

In Section III we turn to empirical issues. First, in Section III.B we review the existing evidence on the subject, finding broad support for the model's main implications. Second, in Sections III.D and III.E we provide some additional evidence drawn from a sample of 37 sub-Saharan African countries. We consider three indicators for the quality of institutions and policies. As in Knack and Keefer (1995), the first indicator summarizes the quality of governance in a country. The second indicator summarizes the quality of macroeconomic and trade policies, following Burnside and Dollar (2000). The third indicator proxies for the level of infrastructures (see Easterly and Levine (1997)). We first show that, in our sample, all three indicators are positively correlated with investment and growth, and then we report some evidence on the determinants of the quality of institutions and policies. Consistently with the predictions of our model, we find that abundance of natural resources has a negative and statistically significant impact on our three measures of governance and

policies. Foreign aid has instead a more ambiguous impact on our indicators. We take this evidence as suggestive that governments of countries that are rich in resources have weaker incentives to follow good policies.

Section IV summarizes the results obtained and presents conclusions.

II. THE MODEL

We start by considering the case when the incumbent government is concerned only with the welfare of its supporters. We then consider the possibility that the government has some care for the welfare of the entire society. Finally, we analyze the impact of aid on policies, and investigate possible remedies to provide correct incentives to reform.

A. Dictatorial Government

We consider a country that has a net endowment given by $Z=R+A$, where R denotes natural resources, such as revenues from primary commodities, and A the amount of donations, *net* of repayments on foreign debt, received from abroad. In the simpler version of the model, we suppose that the country is ruled by a government which is only interested in the welfare of the elite it represents[4] and its objective function is given by

$$U(C_i) = C_i \qquad (1)$$

where C_i denotes the consumption of government's supporters. In this case, the government puts no weight on the welfare of the rest of society, defined as $U(C_r) = C_r$

The government can appropriate a fraction $\phi \in (0,1)$ of the national surplus –which will be defined precisely later– with a certain probability $p \in (0,1)$. The probability p denotes the likelihood that the government remains in office and carries out its program. We assume that ϕ and p are both functions of country's economic liberties, whose level is denoted by Q, with $Q \in [0, \overline{Q}]$. Our notion of "liberalization" underlies several factors. On the one hand, it can entail higher institutional quality, such as less corruption and sounder "rule of law". On the other, it can be reflected by trade and macroeconomic policies, such as lower tariffs and lower government consumption.

---

[4] McGuire and Olson (1996) define this as the "autocrat" or "dictatorial ruler" case. This extreme assumption is not at odds with political experience of Sub-Saharan Africa, where most countries have been ruled by non-democratic governments: see Bratton and van der Walle (1997).

In what follows, we assume that $\phi'(Q)<0$, and $\phi''(Q)<0$: the government's ability to appropriate resources decreases at an increasing rate in Q. In our perspective, then, economic liberalization bears costs for the ruling elite, since the ability to "predate" national surplus becomes lower.[5] We do not make any assumption on the sign of $p'(Q)$ since, *a priori*, an increase in economic liberties has an ambiguous impact on government survival. Consider for example a reform plan pushing towards more liberalization. On the one hand, since reforms reduce the privileges enjoyed by some clienteles supporting the government,[6,7] the risk that the incumbent government is thrown out of office may arise. On the other hand, reforms may reduce the probability of upheaval coming from the parts of society which are not adequately represented by the ruling government. Whichever the relation between policies and political survival, the qualitative results we obtain do *not* depend on the sign of $p'(Q)$. However, as a purely "technical" assumption, we will take $p''(Q)\leq 0$.

In our model, the ruling party can choose to implement a "bad policy", or to concede some economic liberties, together with some investment in infrastructure ("good policy"). We suppose that economic liberalization alone is not sufficient to encourage private investment when a country has poor infrastructures.[8] In particular, we assume that the government needs to spend a fixed amount $I = \bar{I} > 0$ on infrastructure as a condition for economic liberties to be effective. Good policies thus stimulate private investment, K, and private net production, Y. The national surplus is then defined as the sum of Z, the country's endowment, and Y. Obviously, for any *given* level of ϕ, a higher surplus will raise consumption for the ruling elite.

---

[5] The idea that ϕ is reduced by reforms constitutes a crucial difference from Robinson (1999), where the fraction of surplus appropriation is taken to be constant.

[6] Ndulu and O'Connell (1999) report the example of Zambia during the 1980s, where reforms were fiercely opposed by strong pressure groups that enjoyed the benefits of bad policies. These authors argue that reforms often increase the contestability of governments and encourage dictators to oppose development: "President Mobutu opposed Zairian development...because development raised the threat of political demise and the loss of his substantial claim on GDP."

[7] La Ferrara (1996) considers a model (without production) where the decision of a self-interested government to liberalize trade depends upon the possibility to retain political support. In Robinson (1999), the provision of public goods by an autocratic government may encourage collective actions, such as revolutions, on the part of the citizens.

[8] See McGuire and Olson (1996) and Collier and Gunning (1999). Safe property rights, or a favorable taxation regime, may not be enough when transportation routes are not available, or when the available workforce suffers from analphabetism or cannot migrate. Thus, both reforms and infrastructures are taken to be indispensable for the birth of some private entrepreneurship in the "rest" of society.

Events unfold in two stages.

– In stage 1, the country receives an endowment equal to Z, composed of natural resources and foreign aid. The government decides the policy plan (Q,I), and it remains in power with probability $p(Q)$. If the government survives, it carries over the plan, implementing the desired levels of I and R.

– In stage 2, private investors observe (Q,I) and decide the optimal levels of investment and production, equal to K and Y respectively. The government appropriates a fraction $\phi(Q)$ of both Z and Y.

The ruling party's expected consumption is given by the following expression:

$$E(C_i) = p(Q)\cdot\{\phi(Q)\cdot[Z+Y(Q)]-I\}+[1-p(Q)]\cdot\hat{C}_i \qquad (2)$$

where $Y(Q)$ denotes the surplus generated by private investment in the rest of society. According to expression (2), the ruling elite can extract a share ϕ of national surplus with probability p. When the incumbent government is thrown out of office, an event occurring with probability $(1-p)$, the elite will have a consumption level equal to $\hat{C}_i \geq 0$.

The level of expected consumption for the rest of society is given by:

$$E(C_r) = p(Q)\cdot\{[1-\phi(Q)]\cdot[Z+Y(Q)]\}+[1-p(Q)]\cdot\left\{Z+Y(\hat{Q})-\hat{I}-\hat{C}_i\right\}, \qquad (3)$$

where $\left\{Z+Y(\hat{Q})-\hat{I}-\hat{C}_i\right\}$ denotes the net aggregate amount of consumption available to the rest of society when the incumbent government is overthrown. Expressions (2) and (3) underlie the idea that the bulk of entrepreneurial initiative, generating $Y(Q)$, does not belong to the elite supporting the incumbent government. This is rather plausible, since poor institutions discourage wide market participation on behalf of society as a whole.

If the incumbent government decides to implement some public investment, the surplus it can extract from the economy must not be smaller than the cost of infrastructure. Thus, the following budget constraint must be respected:

$$\phi(Q)\cdot[Z+d(I)\cdot Y(Q)]\geq I \qquad (4)$$

In what follows we consider a partisan government that maximizes the expected consumption (2) of its supporters subject to the resource constraint (4). In doing so, the government anticipates that the level of private investment in the rest of society will depend on its decisions about Q and I.[9] We solve the model by backward induction. Given the timing

[9] We deliberately overlook Kydland-Prescott's time-consistency problems, arising from the possibility that once private investment is made, reforms are repealed and private surplus is

(continued)

we postulate, we first characterize the production decision on behalf of private investors, taking the government's decisions as given. Second, we solve for the policy choice, when the government anticipates private investors' reaction.

Consider first stage 2, where private entrepreneurs have to decide how much to invest and produce. Given the policy stance of the government, summarized by the levels of *(Q,I)* determined in stage 1, each private investor chooses capital so to maximize consumption, equal to $(1-\phi)$ times production net of capital costs. In order to streamline the model without any loss of generality, it is sufficient to consider the presence of just one entrepreneur who maximizes his consumption from production, given by $(1-\phi)Y$, by choosing the level of capital K.

Once the government has picked Q in stage 1, the entrepreneur's problem in stage 2 reduces to:

$$\max_{\{K\}} \quad Y = d(I) \cdot s(Q) \cdot K^{\alpha} - r \cdot K \qquad (5)$$

with

$$d(I) = \begin{cases} 0, & \text{if } I < \bar{I} \\ 1, & \text{if } I \geq \bar{I} \end{cases}$$

where r denotes the cost of capital, and $\alpha \in (0,1)$. The function *d(I)* indicates that private investment can be profitable only when there is at least a minimum level of public investment in infrastructure, $\bar{I}$. Furthermore, we assume that poor institutional quality destroys output by generating corruption, insecure property rights, etc. In other words, an economic environment plagued by bad policies generates negative externalities on the private sector.[10] The function *s(Q)* captures the effect of economic liberties on private entrepreneurship, and respects the following properties: $s'(Q)>0$, $s''(Q)<0$, $s(0)=0$. Moreover, $\lim_{Q\to 0} s'(Q) = \infty$, and $\lim_{Q\to \bar{Q}} s'(Q) = 0$. To summarize, expression (5) postulates that net returns from private investment are strictly positive only if the government invests up to

---

expropriated. Indeed, we implicitly assume that private capital is very mobile, in the sense that private entrepreneurs can disinvest their capital at no cost when the economic environment of the country is no longer favorable. Even disregarding time-consistency issues, the model still generates important interactions between government's decisions and private sector behavior.

[10] A similar assumption is made in Svensson (1998), where poor legal infrastructure is detrimental to production.

the amount $\bar{I}$ in infrastructures and implements some economic liberties (i.e., $Q>0$).[11] The solution to problem (5) yields the following:

$$K = \left(\frac{\alpha \cdot d(I) \cdot s(Q)}{r} \right)^{\frac{1}{1-\alpha}} \qquad (6)$$

Thus, net private surplus is given by:

$$Y(Q) = (1-\alpha) \cdot \left(\frac{\alpha}{r}\right)^{\frac{\alpha}{1-\alpha}} \left[d(I) \cdot s(Q) \right]^{\frac{1}{1-\alpha}} \qquad (7)$$

Equation (7) represents the entrepreneur's reaction function to the government choice of Q and I. For $I \geq \bar{I}$, it implies that $Y(0)=0$, $Y'(Q)>0$, and $\lim_{Q \to 0} Y'(Q) = \infty$, $\lim_{Q \to \bar{Q}} Y'(Q) = 0$.

In stage 1, the government anticipates private investor's behavior and solves the following problem:

$$\max_{\{Q,I\}} E\left[C_i(Q,I)\right] = p(Q) \cdot \left\{ \phi(Q) \cdot \left[Z + Y(Q) \right] - \left(I + \hat{C}_i \right) \right\} + \hat{C}_i$$

$$s.t. \qquad \phi(Q) \cdot \left[Z + Y(Q) \right] \geq I \qquad (8)$$

In equilibrium, the condition $\phi(Q) \cdot \left[Z + Y(Q) \right] - I \geq \hat{C}_i$ must hold: by choosing *(Q,I)*, the ruling party cannot do worse than giving up power so to get $\hat{C}_i$. *A fortiori* then, the budget constraint (4) must be respected.

Two cases may arise: *(i)* the government chooses a level of investment in infrastructure such that $I < \bar{I}$; *(ii)* expenditure in infrastructure is set equal to $I \geq \bar{I}$.

Case (i). If the government chooses a level of public investment equal to $I < \bar{I}$, the maximand in expression (8) reduces to:

$$E\left[C_i(Q,I)\right] = p(Q) \cdot \left[\phi(Q) \cdot Z - I - \hat{C}_i \right] + \hat{C}_i \qquad (9)$$

[11] The assumption that "good policies" are necessary for private investment to generate output is consistent with evidence reported in Easterly and Levine (1997). Svensson (1998) also finds that little investment in legal infrastructure generates low levels of domestic investment. Our results in Section 3 are consistent with these findings.

Since investment in infrastructure is insufficient to stimulate private investment, the government finds it optimal to set I=0. Thus, the marginal incentive to reform is given by:

$$\frac{dE[C_i(Q,0)]}{dQ} = p'(Q)\cdot\left[\phi(Q)\cdot Z - \hat{C}_i\right] + \phi'(Q)\cdot p(Q)\cdot Z \qquad (10)$$

It can be noticed that the marginal incentive to reform is always negative when the following inequality holds true: $p'(Q)\cdot\phi(Q) + \phi'(Q)\cdot p(Q) < 0$, where $\phi'(Q) < 0$. This condition implies that the elasticity of political survival to reforms is lower than (the absolute value of) the corresponding elasticity relative to the appropriation rate, which is:

$$\frac{p'(Q)}{p(Q)/Q} < -\frac{\phi'(Q)}{\phi(Q)/Q} \qquad (11)$$

A sufficient condition for (11) to hold is that $p'(Q) \leq 0$. In what follows, we will assume that this condition is always respected. Then:

Lemma 1. When $I = 0$ and condition (11) holds, the maximum level of expected consumption is equal to $E[C_i(0,0)] = p(0)\cdot\left[\phi(0)\cdot Z - \hat{C}_i\right] + \hat{C}_i$.

Case (ii). Suppose that $I \geq \bar{I}$. Given our assumptions, the government' optimal choice is to set public investment equal to $\bar{I}$. Hence, the marginal benefit from reforms is given by:

$$\frac{\partial E[C_i(Q,\bar{I})]}{\partial Q} = \\ = \left(p'(Q)\cdot\phi(Q) + \phi'(Q)\cdot p(Q)\right)\cdot\left[Z + Y(Q)\right] - p'(Q)\cdot\left[\bar{I} + \hat{C}_i\right] + p(Q)\cdot\phi(Q)\cdot Y'(Q) \qquad (12)$$

Consequently, the existence of an internal maximum for Q^* requires the respect of the following first-order condition:

$$\frac{\partial E\left[C_i(Q^*,\bar{I})\right]}{\partial Q} = 0 \qquad (13)$$

Lemma 2. When $I = \bar{I}$, an internal maximum $Q^* \in (0,\bar{Q})$ exists and is unique. Thus, the level of expected consumption is equal to:

$E\left[C_i(Q^*,\bar{I})\right] = p(Q^*)\cdot\left\{\phi(Q^*)\cdot\left[Z + Y(Q^*)\right] - \left[\bar{I} + \hat{C}_i\right]\right\} + \hat{C}_i$.

Proof. See Appendix I.

Note that, if $p'(Q) \leq 0$, the government will have a lower incentive to implement economic liberties. In other words, when good policies jeopardize the chances of political survival, the government takes a more conservative attitude towards liberalization. The reverse is true when better policies buy some support to the government, which is, when it holds that $p'(Q) > 0$. In this case, the incentives to pursue weak policies will be reduced.

From lemmas 1 and 2, the following holds:

Result 1. A rational, dictatorial government will decide to implement some good policies if the following inequality is respected:

$$E\left[C_i(Q^*, \bar{I})\right] \geq E\left[C_i(0,0)\right] \tag{14}$$

Condition (14) can be rewritten as follows

$$\underbrace{\left[p(Q^*)\cdot\phi(Q^*) - p(0)\cdot\phi(0)\right]}_{(-)}\cdot Z + \\ + p(Q^*)\cdot\underbrace{\left[\phi(Q^*)\cdot Y(Q^*) - \bar{I}\right]}_{(+)} - \left[p(Q^*) - p(0)\right]\cdot\hat{C}_i \geq 0 \tag{14'}$$

Expression (14') clarifies the basic mechanisms at work in our model. Without making any assumption on the sign of p', the impact of $\hat{C}_i$ remains ambiguous. However, good policies tend to be implemented when the loss in the ability to appropriate net resources Z (first term in the l.h.s.) is outweighed by the net gain arising from private production (second term in the l.h.s.). Figure 1 illustrates a case when condition (14) holds.

The level of the resources Z has a crucial impact both on the opportunity of introducing economic liberalization *at all*, and on the degree to which good policies are pursued. We summarize these findings in the following:

Result 2. (i) When the government is purely interested in the welfare of the party it represents, resource abundance (high Z) makes the implementation of good policies less likely. Moreover, (ii) even when some reforms are implemented, a higher level of resources will induce more conservatism (lower Q) in the government's behavior.*

Proof. Part (i). By exploiting the envelope theorem, the effect of a larger level of Z on the payoff corresponding to good policies is given by $\frac{dE\left[C_i(Q^*, \bar{I})\right]}{dZ} = p(Q^*)\cdot\phi(Q^*)$. However, under condition (11), a larger Z has a stronger impact on the payoff from bad

policies, since it holds that $\frac{dE[C_i(0,0)]}{dZ} = p(0)\cdot\phi(0) > p(Q^*)\cdot\phi(Q^*)$. Thus, the more abundant are resources, the less likely is the respect of condition (14).

Part (ii). Under the respect of condition (11), differentiation of (13) implies that $\frac{dQ^*}{dZ} < 0$. Thus, an increase in resources will induce the government to reform less and, as a consequence of poor reforms, the equilibrium level of private production will be lower (see equation (7)).[12] ■

Result 2 implies that governments of countries rich in resources, be they natural resources or fungible donations, have low incentives to implement economic liberalization. The pessimistic connotation that this Result bears for foreign aid must however be qualified when the government is subject to financial constraints. This point can be simply shown as follows. When the government *can* access financial markets and issue debt to finance the cost of infrastructure, the debt raised to finance $\bar{I}$ can be repaid since the budget constraint $\phi(Q)[Z+Y(Q)] \geq \bar{I}$ is respected. In this case, the policy chosen *only* depends on the government's incentives, as we showed above.

By contrast, when borrowing is *not* feasible, a government that is willing to implement Q^* must be able to extract sufficient resources from the available endowment Z in order to finance infrastructures. Thus, the condition $\phi(Q^*)\cdot Z \geq \bar{I}$ must hold. Suppose instead that *financial constraints are binding*, so that condition $\phi(Q^*)\cdot Z < \bar{I}$ holds. Then, even when the government would find it optimal to implement $Q^*>0$, it does not have sufficient funds to implement the appropriate level of public investment. In this case, foreign aid can overcome financial constraints and favor good policies.[13]

In the next section we remove the extreme assumption that governments are purely interested in the welfare of the part of society they represent. This has interesting implications, since introducing some care for the "rest of society" in the government's objective function may either capture political regimes that are more democratic than autocracies or proxy for the degree of homogeneity in society.

---

[12] Also note that concavity of the government's objective function implies that the additional gains from reforms are decreasing in Q.

[13] This conclusion is consistent with the findings of Burnside and Dollar (2000) and Dollar and Svensson (2000), who show that foreign aid can help the success of reform programs only when there are adequate political-economy conditions. As Dollar and Svensson put it, "the role of donors is to identify reformers not to create them" (p.896).

B. Government Benevolence and Welfare

The model presented in Section II.A postulates that the government is interested only in the welfare of its supporters. In this section we extend the model to consider the possibility that the government may also care, to some extent, about the welfare of the rest of society. In other words, the objective function of the government puts a weight, denoted by β, on the expected level of consumption available to the rest of society, $E(C_r)$. Here, "benevolence" can be thought of as a simple modeling device that captures the influence exerted by the civil and economic environment of the country on the actions of the government (see Putnam (1993)).

We postulate that all the possible types of government that can take power in the economy are characterized by a certain degree of care for society, β, defined over the support $[0, \frac{1}{2}]$. Note that, when $\beta=0$, the government puts no weight on the welfare of the rest of society, as postulated in Sect. 2.1 above. On the contrary, when $\beta=\frac{1}{2}$, the government weighs the welfare of its supporters as much as the welfare of those in the rest of society. The average level of β is denoted by $\hat{\beta}$, which may proxy either for the degree of democracy, or for the level of "homogeneity" in society, measured by income inequality, ethnical fragmentation, etc. To simplify the exposition, we concentrate on the case when the government always finds it convenient to implement an adequate level of public investment, $I = \bar{I}$: in other words, we assume that condition (14) is always respected.

When the government has some benevolence towards society, its problem becomes:

$$\begin{aligned} &\max_{\{Q\}} \{(1-\beta)\cdot E(C_i) + \beta \cdot E(C_r)\} \\ &s.t. \qquad \phi(Q)\cdot[Z + Y(Q)] \geq \bar{I} \end{aligned} \tag{15}$$

with

$$\begin{aligned} E(C_i) &= p(Q)\cdot\{\phi(Q)\cdot[Z+Y(Q)] - I\} + [1-p(Q)]\cdot\hat{C}_i \\ E(C_r) &= p(Q)\cdot[1-\phi(Q)]\cdot[Z+Y(Q)] + [1-p(Q)]\cdot\left[Z + Y(\hat{Q}) - \hat{I} - \hat{C}_i\right] \end{aligned}$$

where, $\hat{I}$ and $Y(\hat{Q}) \equiv \hat{Y}$ denote, respectively, the levels of I and Y calculated under the expected policy plan $(\hat{Q}, \hat{I})$ that will be implemented *on average* by a new government coming into office with probability $(1-p)$. When solving problem (15), the incumbent government takes $(\hat{Q}, \hat{I})$ as *given*.

We start by considering the case when government's benevolence β is strictly less than ½. The first-order condition relative to problem (15) is:

$$(1-\beta)\cdot\frac{\partial E(C_i)}{\partial Q}+ \\ +\beta\cdot\left\{p'\cdot\left[(1-\phi)\cdot(Z+Y)-(Z+\hat{Y}-\hat{I}-\hat{C}_i)\right]+p\cdot\left[(1-\phi)\cdot Y'-\phi'\cdot(Z+Y)\right]\right\}=0 \tag{16}$$

where $\frac{\partial E(C_i)}{\partial Q}$ is defined by expression (12).

Note that the incumbent's choice of economic liberties is also a function of $\hat{\beta}$. Then, by setting $\beta=\hat{\beta}$ in equation (16), we implicitly obtain the optimal level of economic liberties, $\hat{Q}^*\equiv Q^*(\hat{\beta})$, that an *average* government is willing to implement:

$$\frac{\partial E\left[C_i(\hat{Q}^*,\bar{I})\right]}{\partial Q}+\left(\frac{\hat{\beta}}{1-2\hat{\beta}}\right)\cdot\underbrace{p(\hat{Q}^*)\cdot Y'(\hat{Q}^*)}_{(+)}=0 \tag{17}$$

The following holds:

Result 3. When the average government has a degree of care for the welfare of the rest of society such that $0<\hat{\beta}<\frac{1}{2}$, *then:*

(i) An internal solution $\hat{Q}^*\equiv Q^*(\hat{\beta})$ *exists. A sufficient condition for uniqueness is that the inequality (pY''-p'Y')<0 holds true.*

(ii) An average government that has some care towards society will concede more liberties than an autocratic government: when $0<\hat{\beta}<\frac{1}{2}$, *it holds that* $Q^*(\hat{\beta})>Q^*(0)$.

Proof. Part (i) of the Result is proved in Appendix II. Part (ii) derives immediately from inspection of (17). The presence of some benevolence on behalf of the average government adds a positive term to the l.h.s. of the (17) whenever condition $0<\hat{\beta}<\frac{1}{2}$ holds. Hence, the net marginal benefits from good policies are greater, the greater the care of the typical government for the rest of society. ■

This result implies that government's benevolence encourages good policy and, consequently, private sector activity. Comparative statics on (17) delivers the following results.

Result 4. When $\hat{\beta}<\frac{1}{2}$, *it holds that* $\frac{d\hat{Q}^*}{d\hat{\beta}}>0$: *a higher degree of average government's benevolence,* $\hat{\beta}$, *raises the equilibrium level of economic liberties.*

Result 4 implies that the more a government cares for the welfare of the rest of society, the higher the incentive to adopt policies that, by restraining predatory behavior, encourage private investment.

Concerning the effect of resources on the incentive to concede liberties, the following holds:

Result 5. When $\hat{\beta} < \frac{1}{2}$, *it holds that* $\frac{d\hat{Q}^*}{dZ} < 0$: *a higher level of resources, Z, lowers the equilibrium level of economic liberties.*

Result 5 generalizes Result 2 to the case when $0 < \hat{\beta} < \frac{1}{2}$. However, when $p'(Q)$ is rather small, a resource shock will be less harmful to economic liberties, if the typical government has some care for society.[14]

From a political-economy perspective, it is mostly plausible to restrict attention to the case when condition $\hat{\beta} < \frac{1}{2}$ holds. Even in democracies, it is quite unlikely that the average government has the same care for the rest of society as for its supporters. However, the special case for $\beta = \frac{1}{2}$ carries an interesting implication. The government's objective function, given in (15), reduces to the following expression:

$$\tfrac{1}{2}\left\{p \cdot \left[Z + Y(Q) - I\right] + (1-p) \cdot \left|Z + \hat{Y} - \hat{I}\right|\right\}. \qquad (18)$$

The net marginal benefits from Q, obtained by differentiating (18), are then equal to:

$$p' \cdot \left\{\left[Z + Y(Q) - I\right] - \left|Z + Y(\hat{Q}) - \hat{I}\right|\right\} + p \cdot Y'(Q) \qquad (19)$$

By setting $\beta = \hat{\beta} = \frac{1}{2}$, expression (19) reduces to $p \cdot Y'(Q) > 0$: the marginal benefits from Q are positive all over the support $[0, \overline{Q}]$.[15] Hence, when the average government weighs the welfare of its supporters as much as the welfare of the rest of society, it will implement the *highest feasible level of economic liberties*.[16] This special case thus generates the *same*

---

[14] Formally, it holds that $\frac{d}{d\hat{\beta}}\left[\frac{d\hat{Q}^*}{dZ}\right] > 0$. Taking $\hat{\beta}$ as a proxy for "social capital", this might then explain why different countries react very differently to similar shocks, such as oil windfalls: see Wantchekon (2000) and Burnside and Dollar (2000).

[15] Under the respect of condition (11), net marginal benefits are positive independently of the sign of $p'(Q)$.

solution arising from the social planner problem, where the net surplus of society is maximized under the respect of the budget constraint.

More formally, the planner's program can be written as:

$$\begin{aligned} &\max_{\{Q\}} Z + Y(Q) - \bar{I} \\ &s.t. \quad \phi(Q) \cdot [Z + Y(Q)] \geq \bar{I} \end{aligned} \tag{20}$$

When problem (20) is solved, it may occur that:

(i) If the budget constraint is not binding[17], the optimal solution will be the upper limit $\bar{Q}$.

(ii) If the budget constraint is binding, the optimal level of Q, denoted by $Q^{**} < \bar{Q}$, will be a corner solution given by $\phi(Q^{**}) \cdot [Z + Y(Q^{**})] = \bar{I}$.

Under sub-case *(ii)*, the government sets the lowest level of ϕ (taxation, etc.) consistent with the funding of infrastructures, $\bar{I}$ (see McGuire and Olson, 1996, p.81).

These results have an immediate interpretation. The greater the degree of benevolence on behalf of the government, the higher the level of economic efficiency.

In the next section, we extend the model to analyze the effects of foreign aid when $\beta = 0$.

C. Foreign Aid and Conditionality

As we argue in what follows, the effects of aid crucially depend on the type of support a country is given. The conclusion that countries rich in resources have a weak incentive to implement good policies (Result 2) bears important implications for types of aid such as *donations* or *credit extensions*, which are largely administered by local governments. Donations, denoted by A, raise the country's endowment Z. Consequently, our model predicts that this type of aid tends to reduce the optimal level of Q^* or, at the extreme, it reinforces the desire to keep bad policies in place.[18]

---

[16] This replicates the ideal case of the "consensual democracy," as defined by McGuire and Olson (1996).

[17] Note that a non-binding budget constraint requires that $\phi(\bar{Q}) > 0$ whenever $\bar{I} > 0$.

[18] This observation is consistent with the view that aid can delay reforms. (See Rodrik (1996) and Tsikata (1998)). By adopting a time-inconsistency approach in a game between donors and recipients, Svensson (2000b) shows that the anticipation of aid may reduce the incentives to introduce costly reform policies.

When other types of aid are enforceable, less pessimistic conclusions can be reached. In what follows, we consider two types of intervention. First, we consider the case of conditional aid as a device to reward reforms. Second, we consider the possibility that aid is directly aimed at building some pieces of infrastructure.

Making aid conditional on reforms. Suppose that donors condition aid on the level of economic liberties that is actually implemented. The amount of aid, denoted by H, will depend upon the observed level of Q: $H=H(Q)$, with $H'>0$, and $H''\leq 0$. In this case, the government's objective function (2) takes the form:

$$E(C_i) = p(Q)\cdot\{\phi(Q)\cdot[Z+Y(Q)+H(Q)]-I\}+[1-p(Q)]\cdot\hat{C}_i \qquad (21)$$

Donors can adopt a reward function $H(Q)$ such to stimulate reforms in equilibrium. In particular, the presence of $H(Q)$ in (21) implies greater incentives to implement good policies, relative to the solution to problem (2), when the following condition holds

$$\underbrace{(p'\cdot\phi+p\cdot\phi')}_{(-)}\cdot H+\underbrace{p\cdot\phi\cdot H'}_{(+)}>0 \qquad (22)$$

Thus, conditional aid may induce partisan governments to adopt better policies, so as to enjoy the promised reward. This conclusion, however, ignores possible time-consistency problems. For instance, a government might have incentives to undo reforms after receiving the reward for good policies.[19] The ability to enforce types of conditional aid is discussed in Dollar and Easterly (1999) and Svensson (2000b).

We next consider direct provision of infrastructures, a form of aid that aims at eradicating the "funds-fungibility" problem. This kind of aid policy naturally arises as an implication of the approach followed here.

Direct provision of infrastructure. Foreign countries or international organizations might directly implement investment in infrastructures, such as roads, healthcare, schooling, etc. This form of aid has two desirable properties. First, it limits the concession of fungible funds to local governments. Second, it cuts the cost of infrastructures $\bar{I}$ by the amount of aid, X. Thus, from the point of view of the incumbent government, this particular form of

[19] Indeed, doubts are often raised about the actual incidence of reforms: "..increasingly, the suspicion must be that the deception is deliberately designed to gain just enough respectability to attract private foreign capital, and to qualify more readily for the public sort, from multilateral bodies such as the IMF and the World Bank" (*The Economist*, "Phoney democracies", June 24th 2000).

donation reduces the amount of public investment that is necessary to make reforms attractive.

This point can be simply illustrated as follows. By denoting direct provision of infrastructures by $X \in [0,\bar{I}]$, the equilibrium payoff from good policies is now given by:

$$E\left[C_i(Q^*,\bar{I}-X)\right] = p(Q^*)\cdot\left\{\phi(Q^*)\cdot[Z+Y(Q^*)]-\left[\left(\bar{I}-X\right)+\hat{C}_i\right]\right\}+\hat{C}_i \qquad (23)$$

On the other hand, the payoff from keeping bad policies in place remains equal to $E[C_i(0,0)] = p(0)\cdot\left[\phi(0)\cdot Z-\hat{C}_i\right]+\hat{C}_i$.

Consequently, the government will be willing to implement some good policies if the analog of condition (14) holds:

$$E\left[C_i(Q^*,\bar{I}-X)\right] \geq E[C_i(0,0)], \qquad with \quad X \in [0,\bar{I}] \qquad (24)$$

There exists a value of X in the interval $[0,\bar{I}]$ such that condition (24) is satisfied. To show this, it is sufficient to note that when $X=\bar{I}$, a marginal amount of good policies yields a payoff that dominates the "bad policy" payoff ($Q=0$). Thus, the following holds:

Result 6. When donors can provide an adequate amount of infrastructure directly, autocratic governments will have the incentive to implement some reforms.

This conclusion crucially depends on the complementarity between economic liberties and infrastructures. When international aid can provide some infrastructure, the costs of good policies are reduced, while their gains remain intact. Furthermore, this type of aid can also circumvent the problems associated with financial constraints that prevent governments from borrowing and investing.

III. Empirical Evidence

In what follows, we first summarize the major implications of the model, and then review previous empirical findings. Existing evidence supports the implications of the model. However, in order to test our theory more directly, we provide some additional evidence based on a cross-section of sub-Saharan countries. Our purpose is to assess the role of resource abundance on institutions, policies, and infrastructures within a unified framework.

A. Theoretical Implications

Our model builds on the following mechanism:

(i) A low quality of economic institutions and policies has negative effects on (private) investment and production.

(ii) Abundance of resources reduces the incentive of an elitist government to implement "good policies".

Thus, resources tend to have a negative effect on economic activity *through the quality of economic institutions.*

Point (i) is somewhat undisputed. The idea that sound policies and good institutions are positively related to economic activity has been emphasized in the literature on economic growth: see, for example, Barro and Sala-I-Martin (1995), Knack and Keefer (1995), and Svensson (1998). For this reason, we only report some simple correlations between indicators of "good policy" and a few measures of economic activity, based on our sample of sub-Saharan African countries.

Point (ii) represents the original contribution of our model.Our framework highlights the role of resources as a key factor in determining the quality of the country's economic institutions and policies. In particular:

(a) When a country is rich in natural resources, the government has a bigger incentive to predate national surplus by keeping poor institutions and unsound policies in place, as emphasized by Result 2 and Result 5. We thus expect that measures of natural resources have a negative impact on the quality of economic institutions and policies.[20]
(b) Since foreign aid raises resource abundance, it will lower the quality of economic policies and institutions. However, if donors manage to condition aid on the implementation of reforms, aid can even have a *positive* effect on policies, as emphasized in Section 2.3. Thus, the net effect of aid on policies remains ambiguous *a priori.*
(c) Since resource abundance reduces the incentives to implement good policies, it also makes investment in infrastructure less desirable. However, the model also implies that, for any given level of resources, the higher the *initial* stock of infrastructure, the higher the government's payoff from better economic institutions and polices.
(d) When the government has some "benevolence", it will be more prone to adopt good policies, as shown in Result 4. Government's benevolence can be, to some extent, proxied by measures of "social cohesion" in our regressions.

B. Existing Empirical Evidence

There are two different strands of literature that present empirical evidence broadly supportive of our results. The implication in point (a) is consistent with Sachs and Warner

[20] Recall however that this conclusion holds true in our model *if the country is not subject to credit constraints.*

(1997,1999), who provide cross-country evidence on the negative effects of natural resources on institutional quality and growth.[21] Some literature has also emphasized the perverse effect of resource windfalls on growth in several countries: see Auty (1990), Gelb (1998), and Little and others (1993). According to Tornell and Lane (1999), when legal and political institutions are weak, windfalls in the production sector will increase the rent-seeking activities of (competing) powerful groups, reducing capital accumulation and growth.[22] For the opposite reason, a negative endowment shock may raise the incentive to pursue good policies since, according to our model, even a partisan government may find it convenient to encourage private investment.[23] La Ferrara (1996) finds that negative term-of-trade shocks increase the probability of subsequent trade-liberalization for a sample of sub-Saharan countries.[24]

Several papers have concentrated on the effects of international aid. Boone (1996), Burnside and Dollar (2000), and Dollar and Easterly (1999) on African countries, report evidence showing that aid flows have an ambiguous, and often negative, impact on investment and growth (see also World Bank (1998)). Dollar and Svensson (2000) find that domestic political-economy factors are crucial for the success or failure of policy reform programs supported by adjustment loans. Alesina and Dollar (2000) consider the effect of shocks to bilateral aid on democratization and trade liberalization. They conclude that "there is no tendency for shocks to aid to be followed by changes in democracy or openness." Alesina and Weder (1999) find a weak indication that foreign aid creates a "voracity effect": countries that receive higher levels of aid tend to have higher levels of corruption. This evidence is broadly consistent with the implications in point (b): when conditionality is absent or ineffective, aid raises resource abundance and favors "bad policies".

---

[21] Differently from our approach, Sachs and Warner (1999) argue that increases in natural resources can make economies shift away from manufacturing, where externalities necessary for growth are generated. Rodriguez and Sachs (1999) instead use a Ramsey model to show that countries rich in natural resources display negative rates of growth during the transition to the steady state.

[22] Tornell and Lane (1999) report some evidence based on oil shocks in Nigeria, Venezuela and Mexico.

[23] These implications do not seem at odds with the Latin American experience of the 1980s. After having being subject to debt overhang and negative terms of trade shocks (see Warner (1992)), many Latin American countries have started robust programs of political and economic reforms.

[24] Barro (1999) also finds that natural resources tend to be associated with lower levels of political freedom. This is consistent with the idea that resource abundance biases governments against liberalization in general.

The empirical analysis developed in Svensson (2000a) is particularly relevant to our purposes. By exploiting a large data set of developing countries, he finds that both aid and natural resource booms are positively associated with corruption. In what follows, we will look at the effect of resources both on measures of institutional quality, such as corruption, *and* on measures of macroeconomic and trade policies.

C. Data Set

Our empirical analysis is based on a sample of 37 sub-Saharan countries. The list of countries, data sources, and summary statistics are reported in the Appendices III, IV, and V. This paragraph describes the main features of the data set.

Policy and institution variables. In order to capture the quality of policies implemented in each country, we use two types of indicators, denoted by *IQ* and *POLICY*.[25]

(i) *IQ* captures the level of institutional development, which is a summary measure of indicators from the International Country Risk Guide (see Knack and Keefer (1995)). The indicators summarized by *IQ* are the following: *rule of law* (the extent to which institutions provide effectively for the implementation of law, adjudication of disputes, and orderly succession of power); *corruption in government* (related to the frequency of bribes in areas such as international trade, taxation, and police protection); and *quality of bureaucracy* (a measure of autonomy from political pressure and strength and expertise to govern without drastic changes in policy or interruptions in government services). For each country, *IQ* is calculated as an average of yearly observations from 1982 to 1998.

(ii) *POLICY* measures the quality of macroeconomic and trade policies. Burnside and Dollar (2000) calculate this index as $POLICY = 1.28 + 6.85 \times Budget\ surplus - 1.40 \times Inflation + 2.16 \times Openness$, where *Budget surplus* is the share of fiscal balance over GDP, and *Openness* is the Sachs and Warner's (1995) openness dummy. For each country, *POLICY* is calculated as an average of yearly observations from 1985 to 1995.

Infrastructures. Following Easterly and Levine (1997), we proxy the level of infrastructure by the variable *LTELPW80*, denoting the log of telephones per 1000 workers in the eighties. This variable measures the level of telecommunications and seems to be strongly correlated with other infrastructure variables (see Collier and Gunning (1999)).

---

[25] In our sample, the Pearson correlation coefficient between *IQ* and *POLICY* is 0.38 and is not significant at conventional levels. While the relation between economic policy and institution variables has been investigated in some recent literature (see for example Havrylyshyn and van Rooden (2000)), here we leave the issue of their relative importance aside. Our definition of "good policies" encompasses both economic policy and institution aspects.

Resource variables. We use two types of variables in order to capture "resource abundance", *SNR* and *AID*. Both these measures are backdated with respect to our institutions and policy indicators in order to reduce "reverse causation" problems.

(i) *SNR* denotes the share of mineral production in GNP in 1971, as from Sachs and Warner (1997). This variables characterizes the structural relevance of natural resources in a country. Our basic regressions are also run by replacing *SNR* with *SXP*, the share of export in primary products in GNP in 1970.

(ii) *AID* is calculated as the average amount of aid per country as a fraction of GNP over the period 1965-1980. This variable aggregates different types of aid (conditional and unconditional aid, bilateral or multi-lateral aid, donations and debt-relief) from heterogeneous sources (IMF, Wold Bank, etc.).

Social cohesion variables. These kind of variables are meant to capture the degree of social distress in a country. Our idea is that high levels of social distress are more likely to generate authoritarian governments or, in the perspective of our model, governments with a low degree of "benevolence" (low $\hat{\beta}$). We use two measures of social distress, *REVCOUP* and *ASSASS*:[26]

(i) *REVCOUP* denotes the number of revolutions and coups per year, averaged over the period 1970-80. Although any measure of political instability is potentially endogenous in our model, we still use this (backdated) variable in order to characterize the degree of conflict in the social environment.

(ii) *ASSASS* is the number of assassinations per thousand population in the seventies.

Other variables. In Section III.D we use *GNP per-capita, GNP per-capita growth rate*, and *Gross Domestic Investment* (public plus private investment) as percentage of GNP over the period 1990-1995. In Section III.E, we also use *LGDPEA70*, the natural log of GDP per country divided by the economically-active population, and *LTELPW70*, the log of telephones per 1000 workers in the seventies.

D. Institutions, Policies, and Economic Activity

The relation between economic performance and good economic institutions and policies has been explored in a number of papers. On the one hand, Mauro (1995), Knack and Keefer (1995) and others[27] have analyzed the relation between corruption, efficiency of -

[26] In order to measure for social distress, we also considered the Easterly-Levine index of ethno-linguistic fractionalization. However, this variable was dropped from any reported specification, since it was always found non-significant.

[27] For more recent contributions see also Kaufmann, Kray, Zoido-Lobadon (1999) and Dollar and Kray (2000)

bureaucracy, property rights enforcement, etc., on growth. Svensson (1998) analyzes the relation between legal institutions and investment, finding that a poor judiciary system generates uncertain property rights and low investment. On the other hand, growth literature has emphasized the positive effects that good macroeconomic policies (such as low inflation and low government consumption) and trade openness have on economic performance: see Burnside and Dollar (2000), among many others. Table 1 reports the correlations between our indices of governance and some measures of economic performance, based on our sample of sub-Saharan countries. As expected, institutional quality (*IQ*) and good macroeconomic and trade policies (*POLICY*) are positively associated with investment and growth. Table 1 also shows a positive correlation between infrastructure (as proxied by *LTELPW80*) and economic performance, consistent with the findings of Easterly and Levine (1997).

Next, we analyze the role of resources on governance, the central feature of our papers.

E. Effects of Resource Abundance

In order to assess the effect of resource abundance on the quality of governance, we run three sets of regressions with *IQ*, *POLICY*, and *LTELPW80* as dependent variables. All the explanatory variables are measured over the sixties and the seventies, while the dependent variables are measured over the eighties and the nineties, so as to reduce reverse-causation problems. Each set of regressions includes *LGDPEA70* and *LTELPW70* as explanatory variables to account for inter-country differences. The coefficient associated with *LTELPW70* is expected to have a positive sign, since the model predicts that a greater initial stock of infrastructure reduces the costs of better governance. Each set of regressions also includes *REVCOUP* and *ASSASS* to proxy for the degree of "social cohesion" in a country. These variables are expected to have a negative impact on our indicators of governance quality. Equations are estimated by OLS, with White-corrections for heteroskedasticity[28] Estimates based on Seemingly Unrelated Regression method are also reported.

Governance quality. Table 2 reports the results on the determinants of *IQ*, the Knack-Keefer measure of institutional quality. Consistent with the implications of our basic model,

[28] Each set of regressions reports alternative specifications based on *different* sample sizes, since the exclusion of a regressor most often allows us to use more observations. This procedure has limits as well as advantages. When the sample size is allowed to vary across different specifications, it is difficult to assess whether changes in estimates arise from a change in specification, or from differences in the sample used. However, considering that our sample size is rather small, it is desirable to use the largest number of observations available. Moreover, the comparison between specifications based on different sample sizes allows us to evaluate the robustness of estimates.

column (2.a) shows that both abundance of natural resources, *SNR*, and aid have a negative impact on governance quality. The effect of natural resources is significant at the 5% level. As expected, the variables measuring for social and political conflict, *REVCOUP* and *ASSASS*, have a negative and statistically significant impact on institutional quality. The proxy for the initial stock of infrastructure *LTELPW70* has a positive and significant (at the 10% level) coefficient. This finding is consistent with the idea that a high initial level of infrastructure raises the incentives to reform.

In column (2.b) we drop *LTELPW70*. The coefficient associated to *SNR* is again negative and strongly significant. Moreover, its size remains quite similar across specifications (2.a) and (2.b).The coefficient associated to *AID* remains negative, but becomes now significant at the 5% level and almost doubles in size.

Macroeconomic and trade policies. Table 3 reports the results on the determinants of *POLICY*, the Burnside-Dollar index. By referring to column (3.a), it can be noted that *LGDPEA70*, *LTELPW70* and *ASSASS* have the expected sign, while *REVCOUP* turns out to be positive. Abundance of natural resources, *SNR*, has a negative and statistically significant impact on the quality of macroeconomic and trade policies, consistent with the predictions of the model. By contrast, *AID* has a *positive* and strongly significant effect. This result may be accounted for by the fact that our measure of aid is a broad aggregate and, in many cases, is conditional on implementation of "sound economic policies". On the one hand, "conditionality" of some donations might explain why *AID*, contrary to *SNR*, is positively related to the *POLICY* index: indeed, resource abundance is fungible for a government and, according to our model, creates perverse incentives. On the other, aid seems to have opposite effects on our indexes of "good policy". While it is feasible for a donor to put clauses on macroeconomic and trade policy variables, which are easily verifiable, it is much more difficult to condition aid on the quality of governance, as measured by *IQ* in Table 2.[29]

For analogy with the analysis of *IQ*, in column (3.b) we drop *LTELPW70*. The significance of the regression worsens dramatically. However, the coefficient associated with *SNR* is still negative and significant, and its size remains substantially stable across both specifications.

Infrastructures. Table 4 reports the results on the determinants of our proxy for infrastructure, *LTELPW80*. As shown in column (4.a), *LGDPEA70*, *LTELPW70*, *ASSASS* and *REVCOUP* have the expected sign. Again, the coefficient associated with *SNR* is negative,

[29] In regressions not reported here, we have also used the Barro (1999) index for the degree of democracy in 1975, a measures of the socio-political environment of a country. Although the use of this variable reduces severely the number of available observations, the results we obtained are twofold. First, the coefficient associated with *SNR* remains negative, significant, and stable in size in both *IQ* and *POLICY* regressions. Second, the impact of *AID* is confirmed to be negative and significant only in the *IQ* regression, while it turns out to be slightly *negative* and not significant in the regression for *POLICY*. This calls for additional caution when judging the effect of aid on future macroeconomic and trade policies.

although marginally non-significant. *AID* has a positive sign, but it is strongly not significant. In column (4.b) we drop *ASSASS*, which was non-significant in (4.a). In column (4.c) we drop *AID*, since it remains very far from conventional levels of significance: under this specification, *SNR* remains negative and becomes significant at the 10% level. Note again that the size of the coefficient associated with natural resources is stable across all specifications.

The residuals of the regression for *LTELPW80* in column (4.a) are non-negligibly correlated both with the residuals of the regression for *IQ* in column (2.a), and with the residuals of the regression for *POLICY* in column (3.a). Thus, in Table 5 we estimate our base specification by Seemingly Unrelated Regression method. The results we obtain are very similar to OLS estimates. Note however that *AID* becomes strongly significant also in the base equation for *IQ*.

In Table 6, we replace *SNR* with *SXP* in our basic specifications for *IQ*, *POLICY*, and *LTELPW80* to assess the robustness of our results to changes in the measure of natural resources.[30] Again, the sign of the coefficient of *SXP* is always negative, and it is not significant only in the regression for *POLICY*.[31] [32]

Summarizing, our results carry two main implications. First, as predicted by the theoretical model, abundance of natural resources seems to have a negative effect on each of our three indicators of "policy quality". Also, this effect is rather stable across different specifications in each set of regressions. Thus, the idea that a government will pursue low levels of economic liberalization when the country is rich in natural resources is consistent with our findings. Second, the impact of international aid is rather uncertain, and depends on the index of policy and institutional quality that one considers. This ambiguity can be accounted for by our model, since donors often condition aid on macroeconomic and trade policies. By contrast, resource abundance leaves governments free to pursue their interests.

---

[30] *SXP* is used as regressor in Sachs and Warner (1997), Svensson (2000a), and Barro (1999). The Pearson-correlation coefficient between *SXP* and *SNR* is 0.54 and is significant at the 1% level.

[31] Note however that the *F*-statistics of the regression for *POLICY* based on *SNR* (see column (3.a)) is significant at the 5% level, while the corresponding value when *SXP* is used is not significant at any conventional level.

[32] By using Seemingly Unrelated Regression method for the system that includes *SXP* as a regressor, we obtain results that are very similar to OLS estimations summarized in Table 6. However, the coefficient associated with *SXP* in the equation for *LTELPW80* becomes significantly negative at the 10%-level.

IV. Concluding Remarks

Our empirical and theoretical results point to a main conclusion: abundance of resources can have perverse effects on investment and growth. While this conclusion is by no means new –for an updated survey on the "curse of natural resources" see Sachs and Warner (2001)- the novelty of our model lies in the political economy mechanism we investigate. Here, the incentives of a self-interested government to implement reforms leading to investment and growth are weaker when resources are abundant. Our explanation may co-exist with other stories. In particular, Gylfason (2001) shows that resource abundance has a negative effect on growth because it reduces public investment in education.

From this standpoint, our paper gives some policy suggestions on what international institutions can do to encourage the adoption of good policies; that is, how to make foreign aid work.

First, in our model the effects of donations crucially depend both on the government's attitude towards society, and on the relation between reforms and political support. This can be particularly relevant when foreign aid is concerned. When the government cares about the welfare of its citizens, then foreign aid can stimulate reform implementation. Thus, consistently with the conclusions of Dollar and Svensson (2000) on adjustment loans, a better targeting of foreign aid towards countries where a "benevolent" government is in office would deliver more effective results. Our analysis thus calls international institutions to take into greater account the political and economic regime of a receiving countries when assessing aid opportunities.

Second, our results strongly argue in favor of making aid conditional on reforms and providing infrastructures directly. Theoretically, these forms of aid dominate unconditional money donations. Donors should however pay more attention to the quality of institutions, such as low corruption, safer property rights, etc. Indeed, a suggested interpretation for our preliminary evidence is the following. While conditional aid programs tend to stimulate better macroeconomic and trade policies, they allow governments to keep bad institutions in place. We leave this issue to future research.

Finally, a word of caution. The political economy channel we emphasize implies that reforms imply a trade-off for a self-interested governments. On the one hand, by implementing reforms, the government would benefit from a *larger* national surplus; on the other hand, the government would extract only a reduced fraction of national surplus. However, there are some caveats to be made. First, when better policies buy some support to the government, the perverse role of resource abundance on reforms is reduced. There are indeed virtuous cases, the best known being Botswana, in which abundance in natural resources has gone hand in hand with very high rates of growth. Second, there could be impediments to the ability to pursue reforms, even for governments seriously committed to them. Politically unpopular policies have typically low chances of being implemented, in particular in countries with strong civil institutions or with high level of poverty and unemployment.

Table 1. Institutions, Policies, Infrastructures and Economic Activity

	IQ	POLICY	LTELPW80
GNP per-capita	0,37**	0,35	0,45**
GNP per-capita Growth Rate	0,22	0,46**	0,20
Gross Domestic Investment	0,14	0,53**	0,44**

** Correlation is significant at the 5% level (2-tailed)

Table 2. Resources and Institutions

Dependent variable: *IQ*		
	(2.a)	(2.b)
Constant	0.241	-0.030
	(0.82)	*(-0.09)*
LGDPEA70	0.029	0.078*
	(0.76)	*(1.79)*
LTELPW70	0.032*	-
	(1.87)	-
REVCOUP	-0.142*	-0.193**
	(-1.80)	*(-2.46)*
ASSASS	-0.854**	-0.723**
	(-3.94)	*(-3.80)*
SNR	-0.295**	-0.337**
	(-3.70)	*(-4.33)*
AID	-0.486	-0.869**
	(-1.38)	*(-3.61)*
F-statistics	4.31**	5.36**
Adj. R2	0.486	0.487
N. Obs.	22	24

Note: OLS regressions, *t*-statistics in parenthesis.
White Heteroskedasticity-Consistent Standard Errors & Covariance.
** (*) denotes significance at the 5% (10%)

Table 3. Resources and Policy

Dependent variable: *POLICY*		
	(3.a)	(3.b)
Constant	-10.689**	-9.188*
	(-2.24)	*(-1.87)*
LGDPEA70	1.270	1.395*
	(1.78)	*(2.06)*
LTELPW70	0.633	-
	(1.58)	-
REVCOUP	3.568**	1.014
	(2.38)	*(0.61)*
ASSASS	-26.788**	-11.077
	(-2.73)	*(-0.96)*
SNR	-3.708*	-3.832**
	(-2.04)	*(-2.29)*
AID	24.078**	10.464
	(2.81)	*(1.61)*
F-statistics	3.28**	1.73
Adj. R2	0.461	0.177
N. Obs.	17	18

Note: OLS regressions, *t*-statistics in parenthesis.
White Heteroskedasticity-Consistent Standard Errors & Covariance.
** (*) denotes significance at the 5% (10%)

Table 4. Resources and Infrastructures

Dependent variable: *LTELPW80*			
	(4.a)	(4.b)	(4.c)
Constant	-1.990	-1.858	-0.570
	(-1.37)	*(-1.30)*	*(-0.55)*
LGDPEA70	0.348*	0.335*	0.170
	(1.87)	*(1.83)*	*(1.17)*
LTELPW70	0.866**	0.853**	0.875**
	(10.33)	*(10.96)*	*(16.31)*
REVCOUP	-0.328	-0.368	-0.337*
	(-1.46)	*(-1.65)*	*(-1.85)*
ASSASS	-0.844	-	-
	(-0.93)	-	-
SNR	-0.715	-0.690*	-0.717**
	(-1.76)	*(-1.86)*	*(-2.13)*
AID	1.383	1.145	-
	(0.53)	*(0.44)*	-
F-statistics	32.65**	41.02**	61.34**
Adj. R2	0.91	0.91	0.91
N. Obs.	20	20	24

Note: OLS regressions, *t*-statistics in parenthesis.
White Heteroskedasticity-Consistent Standard Errors & Covariance.
** (*) denotes significance at the 5% (10%)

Table 5. Seemingly Unrelated Regression Estimation

Dependent variable	*IQ*	*POLICY*	*LTELPW80*
Constant	0.219	-10.758**	-1.572
	(0.90)	*(-2.83)*	*(-1.56)*
LGDPEA70	0.033	1.294**	0.321**
	(0.95)	*(2.48)*	*(2.34)*
LTELPW70	0.032*	0.621**	0.829**
	(1.89)	*(2.81)*	*(11.87)*
REVCOUP	-0.147**	3.680**	-0.438**
	(-2.95)	*(3.31)*	*(-2.08)*
ASSASS	-0.877**	-30.662**	-0.726
	(-3.12)	*(-3.15)*	*(-0.67)*
SNR	-0.298**	-3.769**	-0.759**
	(-3.45)	*(-3.06)*	*(-2.16)*
AID	-0.514**	22.902**	-0.148
	(-2.09)	*(4.44)*	*(-0.08)*
Adj. R2	0.48	0.45	0.91
N. Obs.	22	17	20

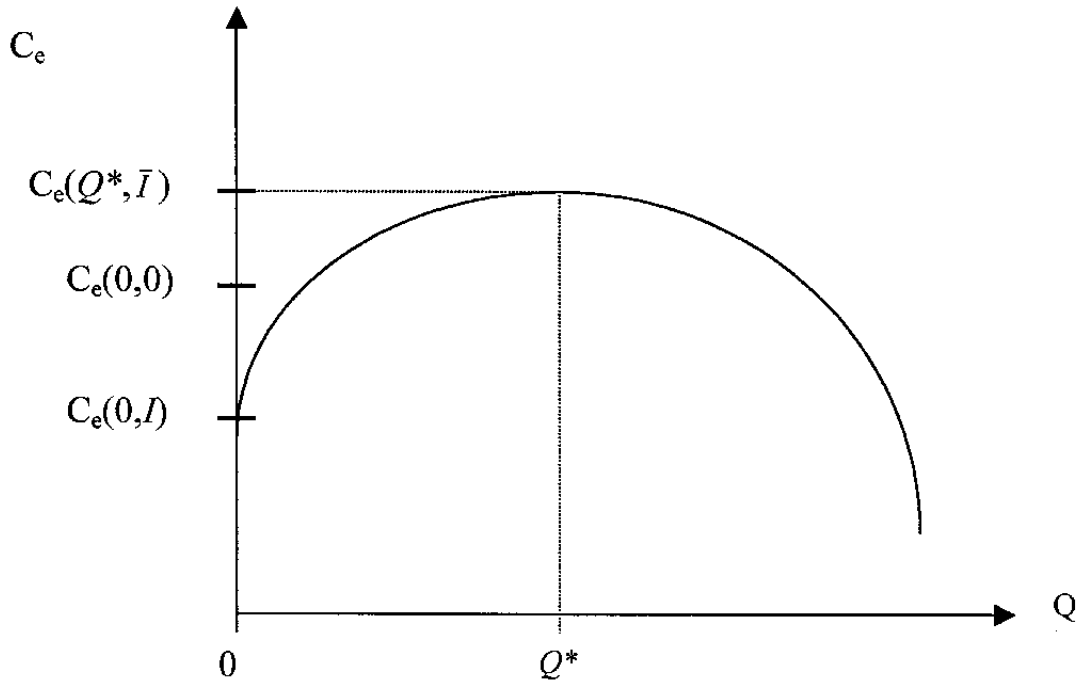
Note: *t*-statistics in parenthesis.
** (*) denotes significance at the 5% (10%)

Table 6. Results with the Share of Exports of Primary Products

Dependent variable	*IQ*	*POLICY*	*LTELPW80*
Constant	0.91**	-3.45	0.27
	(4.57)	*(-0.85)*	*(0.14)*
LGDPEA70	-0.06*	0.23	0.06
	(-2.10)	*(0.51)*	*(0.27)*
LTELPW70	0.06**	0.88**	0.91**
	(3.27)	*(2.31)*	*(9.57)*
REVCOUP	-0.28**	3.10	-0.57
	(-4.36)	*(1.49)*	*(-1.35)*
ASSASS	-0.70**	-28.65**	-0.43
	(-3.94)	*(-2.56)*	*(-0.37)*
SXP	-0.33**	-2.30	-0.88
	(-2.74)	*(-0.95)*	*(-1.67)*
AID	-0.51**	24.34**	0.27
	(-2.75)	*(2.40)*	*(0.09)*
F-statistics	7.14**	1.96	26.67**
Adj. R2	0.65	0.27	0.90
N. Obs.	21	17	18

Note: OLS regressions, *t*-statistics in parenthesis.
White Heteroskedasticity-Consistent Standard Errors & Covariance.
** (*) denotes significance at the 5% (10%)

Figure 1. The optimal level of Q



References

Acemoglu D. and J. A. Robinson (1998), "Why did the West extend the franchise? Democracy, inequality and growth in historical perspective", CEPR Discussion Paper No.1797.

Acemoglu D. and J. A. Robinson (1999), "Democratization or repression ?", CEPR Discussion Paper No.2278.

Alesina A. and D. Dollar (2000), "Who gives foreign aid to whom and why?", Journal of Economic Growth, 5, 33-64.

Alesina A. and B. Weder (1999), "Do corrupt governments receive less foreign aid?", NBER Working Paper No.7108.

Auty R. M. (1990), Resource-Based Industrialization: Sowing the Oil in Eight Developing Countries. New York: Oxford University Press.

Barro R. (1999), "Determinants of democracy", Journal of Political Economy, 107, S158-S183.

Barro R. and X. Sala-I-Martin (1995), Economic Growth. New York: McGraw-Hill.

Boone P. (1996), "Politics and the effectiveness of foreign aid", European Economic Review, 40, 289-329.

Bratton M. and van de Walle N. (1997), Democratic Experiments in Africa. Cambridge: Cambridge University Press.

Burnside C. and D. Dollar (2000), "Aid, policies, and growth", American Economic Review, 90, 847-868.

Collier P. and J.W. Gunning (1999), "Why has Africa grown slowly?", Journal of Economic Perspectives, 13, 3-22.

Dollar D. and W. Easterly (1999), "The search for the key: aid, investment, and policies in Africa", Journal of African Economies, 8, 528-545.

Dollar D. and A. Kray (2000), "Property rights, political rights, and the development of poor countries in the post-colonial period", mimeo, The World Bank (www.worldbank.org/research/growth).

Dollar D. and J. Svensson (2000), "What explains the success or failure of structural adjustment programmes?", Economic Journal, 110, 894-917.

Easterly W. and R. Levine (1997), "Africa's growth tragedy: policies and ethnic divisions", Quarterly Journal of Economics, 112, 1203-1250.

Gelb A. H. (1998), Windfall Gains: Blessing or Curse?. New York: Oxford University Press.

Gylfason T. (2001), "Natural resources, education, and economic development", European Economic Review, 45, 847-859.

Havrylyshyn O. and Van Rooden R. (2000) "Institutions matter in transition, but so do policies". IMF Working Paper WP/00/70.

Kaufmann D. A. Kray, P. Zoido-Lobaton (1999), "Governance matters", mimeo, The World Bank (www.worldbank.org/research/growth).

Knack S. and P. Keefer (1995), "Institutions and economic performance: cross-country tests using alternative institutional measures", Economics and Politics, 7, 207-227.

La Ferrara E. (1996), "A political equilibrium approach to trade liberalization in developing countries", Journal of International Trade & Economic Development, 5, 287-318.

Little I.M.D. and others (1993), Booms, Crisis, and Adjustment. New York: Oxford University Press for the World Bank.

Mauro P. (1995), "Corruption and growth", Quarterly Journal of Economics, 110, 681-712.

McGuire M. and M. Olson Jr. (1996), "The economics of autocracy and majority rule: the invisible hand and the use of force", Journal of Economic Literature, 34, 72-96.

Ndulu B. and S. O'Connell (1999), "Governance and growth in Sub-Saharan Africa", Journal of Economic Perspectives, 13, 41-66.

Robinson J. (1999), "When is a state predatory ?", CES Working Paper No.178, University of Munich.

Rodrìguez F. and J. Sachs (1999), "Why do resource-abundant economies grow more slowly?, Journal of Economic Growth, 4, 277-303.

Putnam R.D. (1993), Making democracy work: civic traditions in modern Italy (with R. Leonardi and R. Nanetti), Princeton N.J., Princeton University Press.

Rodrik D. (1996), "Understanding economic policy reform", Journal of Economic Literature, 34, 9-41.

Sachs J. and A. Warner (1995), "Natural resource abundance and economic growth", NBER Working Paper No.5398.

Sachs J. and A. Warner (1997), "Natural resource abundance and economic growth", mimeo, Center for International Development, Harvard University.

Sachs J. and A. Warner (1999), "The big push, natural resource booms and growth", Journal of Development Economics, 59, 43-76.

Sachs J. and A. Warner (2001), "The curse of natural resources ", European Economic Review, 45, 827-838.

Svensson J. (1998), "Investment, property rights and political instability: theory and evidence", European Economic Review, 42, 1317-1341.

Svensson J. (2000a), "Foreign aid and rent-seeking", Journal of International Economics, 51, 437-461.

Svensson J. (2000b), "When is foreign aid policy credible? Aid dependence and conditionality", Journal of Development Economics, 61, 61-84.

Shleifer A. and R. Vishny (1997), "A survey of corporate governance", Journal of Finance, 52, 737-783.

Tornell A. and P. Lane (1999), "The voracity effect", American Economic Review, 89, 22-46.

Tsikata T. (1998), "Aid effectiveness: a survey of the recent empirical literature", IMF Working Paper PPAA/98/1.

Warner A. (1992), "Did the debt crisis cause the investment crisis?", Quarterly Journal of Economics, 107, 1161-1186.

Wantchekon L. (2000), "Why do resource abundant countries have authoritarian governments?", mimeo, Yale University.

World Bank (1998), Assessing aid: what works, what doesn't, and why. New York: Oxford University Press for the World Bank.

Proof of Lemma 2

The objective function $E\left[C_i(Q,\bar{I})\right]$ is continuous and differentiable in Q.

Existence. Consider the expression for $\frac{\partial E(C_i)}{\partial Q}$ given in (12). Existence of an internal solution for Q^* follows directly from the fact that that both conditions *(i)* $\lim_{Q\to 0}\frac{\partial E(C_i)}{\partial Q} > 0$, and *(ii)* $\lim_{Q\to \hat{Q}}\frac{\partial E(C_i)}{\partial Q} < 0$ hold true.

Consider condition *(i)*:

$$\lim_{Q\to 0}\frac{\partial E\left[C_i(Q,\bar{I})\right]}{\partial Q} = \lim_{Q\to 0}\left\{\left(p'\cdot\phi+\phi'\cdot p\right)\cdot Z - p'\cdot\left[\bar{I}+\hat{C}_i\right]+p\cdot\phi\cdot Y'\right\} > 0 \qquad \text{(A1.1)}$$

since *s(0)=0* and $\lim_{Q\to 0} s'(Q) = \infty$ imply, respectively, that *Y(0)=0* and $\lim_{Q\to 0} Y'(Q) = \infty$. Concavity of ϕ also ensures that $\lim_{Q\to 0}\phi'(Q) > -\infty$.

Consider condition *(ii)*:

$$\lim_{Q\to \hat{Q}}\frac{\partial E\left[C_i(Q,\bar{I})\right]}{\partial Q} = \lim_{Q\to \hat{Q}}\left\{\left(p'\cdot\phi+\phi'\cdot p\right)\cdot\left[Z+Y\right]- p'\cdot\left[\bar{I}+\hat{C}_i\right]\right\} < 0 \qquad \text{(A1.2)}$$

since $\lim_{Q\to \hat{Q}} s'(Q) = 0$ implies that $\lim_{Q\to \hat{Q}} Y'(Q) = 0$ and, under the respect of (11), the inequality $\left\{\left(p'\cdot\phi+\phi'\cdot p\right)\cdot\left[Z+Y\right]- p'\cdot\left[\bar{I}+\hat{C}_i\right]\right\} < 0$ holds independently of the sign of p'.

Uniqueness. To demonstrate uniqueness of the maximum Q^*, we consider the second-order condition:

$$\begin{aligned}\frac{\partial^2 E(C_i)}{\partial Q^2} = &\left\{p''\cdot\left[\phi\cdot(Z+Y)-\bar{I}-\hat{C}_i\right]+2p'\left[\phi'\cdot(Z+Y)+\phi\cdot Y'\right]\right\}+\\ &+p\cdot\left\{\phi''\cdot(Z+Y)+2\phi'\cdot Y'+\phi\cdot Y''\right\}\end{aligned} \qquad \text{(A1.3)}$$

When the first-order condition $\frac{\partial E(C_i)}{\partial Q} = 0$ is respected, the following holds:

$$\left[\phi' \cdot (Z+Y) + \phi \cdot Y'\right] = \frac{-p'}{p} \cdot \left[\phi \cdot (Z+Y) - \bar{I} - \hat{C}_i\right] \qquad \text{(A1.4)}$$

Then, by calculating (A1.3) under (A1.4), one obtains that:

$$\frac{\partial^2 E(C_i)}{\partial Q^2} = \underbrace{\left[\phi \cdot (Z+Y) - \bar{I} - \hat{C}_i\right]}_{(+)} \cdot \underbrace{\left\{p'' - \frac{2 \cdot (p')^2}{p}\right\}}_{(-)} + p \cdot \underbrace{\left\{\phi'' \cdot (Z+Y) + 2\phi' \cdot Y' + \phi \cdot Y''\right\}}_{(-)} < 0 \qquad \text{(A1.5)}$$

Thus, since the objective function is continuous and differentiable, there is a unique global maximum. ■

Proof of Result 3, Part (i)

Existence. The objective function in (15) is continuous and differentiable. An internal maximum exists if conditions (A1.6) and (A1.7) stated below hold together:

$$\lim_{\hat{Q}\to 0}\left\{\left(1-2\hat{\beta}\right)\cdot\frac{\partial E(C_i)}{\partial \hat{Q}}+\hat{\beta}\cdot p\cdot Y'\right\}>0 \qquad \text{(A1.6)}$$

Condition (A1.6) follows directly from (A1.1) in Appendix A (also note that $\lim_{\hat{Q}\to 0} Y'(\hat{Q})=\infty$).

Moreover:

$$\lim_{\hat{Q}\to \overline{Q}}\left\{\left(1-2\hat{\beta}\right)\cdot\frac{\partial E(C_i)}{\partial \hat{Q}}+\hat{\beta}\cdot p\cdot Y'\right\}=\left(1-2\hat{\beta}\right)\underbrace{\lim_{\hat{Q}\to \overline{Q}}\left[\frac{\partial E(C_i)}{\partial Q}\right]}_{(-)}+\hat{\beta}\cdot 0<0 \qquad \text{(A1.7)}$$

Condition (A1.7) follows directly from (A1.2) in Appendix A.

Uniqueness. The maximum is unique if the second-order condition, calculated when the first-order condition (17) is respected, is negative:

$$\left\{\underbrace{\left(p''-\frac{(p')^2}{p}\right)}_{(-)}\cdot\underbrace{\left[\phi\cdot[Z+Y]-\overline{I}-\hat{C}_i\right]}_{(+)}\right\}+ \qquad \text{(A1.8)}$$

$$+\left\{\left(\frac{\hat{\beta}}{1-2\hat{\beta}}\right)\cdot\left[\underbrace{p\cdot Y''}_{(-)}-\underbrace{p'\cdot Y'}_{(?)}\right]\right\}<0$$

A sufficient condition for the respect of (A1.8) is that $\left(p\cdot Y''-p'\cdot Y'\right)<0$. ■

Country List

Angola; Benin; Botswana; Burkina Faso; Burundi; Cameroon; Central African Republic; Congo, Dem. Rep. Of; Congo, Rep. Of; Ethiopia; Gabon; Gambia; Ghana; Guinea; Guinea-Bissau; Ivory Coast; Kenya; Lesotho; Liberia; Madagascar; Malawi; Mali; Mozambique; Namibia; Niger; Rwanda; Senegal; Sierra Leone; Somalia; Sudan; Swaziland; Tanzania; Togo; Uganda; Zambia; Zimbabwe.

List of Variables and Sources

Variable	Definition	Source
IQ	Institutional quality index	Knack and Keefer (1995)
POLICY	Macroeconomic policy and openness index	Burnside and Dollar (2000)
LTELPW80	Log of telephones per 1000 workers in the eighties	Easterly and Levine (1997)
SNR	Share of mineral production in GNP in 1971	Sachs and Warner (1997)
SXP	Share of export of primary products in GNP in 1970	Sachs and Warner (1997)
AID	Average aid (% of GDP), 1965-80	WB-WDI
REVCOUP	Average number of revolutions and coups per year, 1970-80	Barro and Lee (1994), *Panel Data Set Cross Countries,* Data Diskette
ASSASS	Average number of assassinations per thousand population per year during the seventies	Easterly and Levine (1997)
LGDPEA70	Natural log of real GDP divided by the economically active population in 1970	Sachs and Warner (1997)
LTELPW70	Log of telephones per 1000 workers in the seventies	Easterly and Levine (1997)
GNP-per capita	Average GNP per-capita, 1990-95	WB-WDI
GNP-per capita Growth Rate	Average GNP per-capita growth rate, 1990-95	WB-WDI
Gross Domestic Investment	Average Gross domestic investment (public and private), 1990-95	WB-WDI

Summary statistics

	Minimum	Maximum	Mean	Std. Dev.	Obs.
IQ	0.20	0.59	0.39	0.10	28
POLICY	0.10	4.00	1.37	1.05	22
LTELPW80	0.61	4.17	1.37	0.95	25
LGDPEA70	6.32	8.70	7.41	0.60	38
LTELPW70	-0.04	3.95	1.79	0.94	32
REVCOUP	0.00	1.00	0.26	0.24	37
ASSASS	0.00	0.20	0.01	0.03	38
SNR	0.00	0.77	0.12	0.19	36
SXP	0.04	0.54	0.18	0.12	30
AID	0.00	0.24	0.08	0.06	32