Political Activism and Redistribution

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Abstract

I investigate the relationship between poverty, inequality and redistribution under the assumption that redistribution depends both on the individual intensity of political activity and on the enforcement of property rights. Because poverty hinders political activity while inequality encourages it, redistribution peaks at intermediate levels of inequality. Nonetheless, when I endogenize the degree of state resistance to redistributive pressures the previous relationship remains in general ambiguous except for a small set of "autocratic" regimes. Finally, I study the empirical association between inequality and redistribution for different political regimes, which appears to confirm the theoretical predictions.

1 Introduction

Recent studies on the politics of redistribution have focused attention on democratic societies, assuming that voters have the power to choose the optimal level of redistribution.[1] Many countries, however, do not qualify as democratic,[2] and redistribution - or at least redistribution to the poor - may then be driven by the presence or the threat of *social conflict*. Moreover,

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[1]See next section.

[2]For instance, Przeworsky et al. (2000) currently classify 81 countries out of a sample of 141 as autocratic.

even in democratic regimes social conflict appears to increase redistributive pressures.[3]

In this paper we presume therefore that the transfer an agent receives from the government depends on her intensity of political activity. The view that social conflict derives from rational cost-benefit analysis is not new (see the early studies of Olson, 1965, Tilly, 1978, and Hardin, 1982). What is new is that we link the costs to *poverty*, and the benefits to *inequality*. Indeed, there exists evidence that highly unequal societies tend to be more conflictual; at the same time another strand of the literature also argues that poverty acts as a barrier to conflict. To use the words of Hoffer (1951), "Poverty itself is a barrier to instability. Those who are concerned about the immediate goal of the next meal are not apt to worry about the grand transformation of society".[4] Yet, while numerous empirical and theoretical studies acknowledge that poverty and inequality affect political participation (see next section), to the best of our knowledge no study analyzes their *joint* effect.

The main result concerns the relationship between inequality and aggregate transfers, which is shown to depend on the type of political regime: more precisely, we obtain that transfers peak at intermediate levels of inequality in regimes that we define as "pure autocracies", while in "mixed regimes", which can be associated to democracies, the relationship remains ambiguous. We then study the empirical relationship between inequality and transfers for different political regimes, which appears to confirm the theoretical results.

The core of our theoretical analysis is based on two premises that attempt to capture the two features discussed above. First, we assume that transfers are specific to interest groups of agents with similar wealth, and that agents need to spend time in political activity at the expense of production in order to obtain transfers from the government. Consequently, richer agents tend to be *less* active because they are better off by devoting more time to production. On the other hand, we assume that political activity entails a fixed cost that agents have to pay upfront. This creates the oppo-

[3] For instance, Piven and Cloward (1971) argue that the creation and expansion of the welfare state in the United States has been often a reaction to popular pressures, and Goldfield (1989) shows how worker insurgency has contributed to the passage of the 1935 National Labor Relations Act. Moreover, as a historical phenomenon social conflict does not necessarily decrease with the advent of democracy: for instance, the work of Shorter and Tilly (1971) documents that in the 1960s strikes in France were more frequent and involved a greater number of workers than in the late nineteenth century.

[4] Cited in Huntington (1968).

site tendency: an increase in the wealth of poor agents makes them likely to be *more* active because they need less production time to satisfy the cost constraint.[5] These assumptions on production and on the cost of political activity drive the main result: *political activity follows an inverted-U relationship with respect to individual wealth* [Proposition 1]. This observation will lie at the heart of all our results.

Next, we aggregate all transfers and look at the relationship between aggregate transfers, per capita income, and inequality. We show that *for a given income distribution aggregate transfers increase with per capita income*, because poor agents can satisfy the fixed cost constraint with less production time. On the other hand, *for a given level of per capita income aggregate transfers peak at intermediate levels of inequality* [Proposition 3]. Indeed, transfers tend to increase at low inequality levels due to higher gains from political activity, and to decrease at high levels because most agents cannot afford to be politically active anymore.

We also consider the case where rich agents can engage into lobbying, and invest money instead of their own time. Nonetheless, lobbying affects the *level* of aggregate transfers, but not necessarily the dynamics with respect to per capita income and inequality [section 3.5].

Because transfers are specific to interest groups the model is similar to a tragedy of the commons: every coalition, in choosing its optimal level of political activity, disregards its effects on aggregate transfers. A government, however, can resist redistributive pressures by means of the legal system and its enforcement. We therefore proceed to endogenize the intensity of enforcement, and assume that some "decisive agent" can choose an optimal level of "law enforcement" which lowers transfers for given levels of political activity. "Law enforcement" is endogenous, and encompasses all actions directed to resist redistribution and to protect property rights *as defined by the decisive agent*. For instance, in the United States decentralized bargaining and the legal use of permanent replacement workers have weakened the power of unions (Fantasia and Voss, 2003); in more extreme cases, high police and military expenditure decrease the effectiveness of insurgency.

We do not necessarily think of the decisive agent as a "median voter" in any democratic mechanism, though this interpretation is not excluded. Just

[5] We do not necessarily assume that *all types* of conflict require a fixed investment. For instance, agents may engage in civil violence when expectations change or are not met, even if the benefits are unclear (see, for instance, de Tocqueville, 1856, and Gurr, 1970). The model does not necessarily contradict this view, as it only requires that for political activity to be *effective* (so that it translates into transfers) agents need to overcome the fixed cost constraint.

who is decisive is, in a way, a reflection of the political and economic structure of the society in question. In particular, an admittedly rough measure of the degree of "autocracy" in a society would be the relative wealth of this decisive agent, and in what follows we adopt this interpretation.

Observe that the decisive agent faces a tradeoff between several factors: the increased tax burden of enforcement activity, the decreased tax burden of reduced aggregate transfers, and possibly the decreased returns from her own political activity as a member of some interest group. If the decisive agent is rich enough to be unconstrained in her level of political activity then *an increase in her wealth (or in overall "autocracy") will reduce the relative importance of her own political activity, and optimal enforcement will rise* [Proposition 4]. It is in this sense that more autocratic societies are more "repressive". Indeed, in the limit as the decisive agent is no longer a militant the level of enforcement will be chosen to minimize the tax burden.

With this established, we return to the exercise of studying redistribution when there are exogenous changes in per capita income and inequality. For a given income distribution, we show that *both the enforcement level and political activity are, on average, increasing functions of per capita income* [Proposition 5]. There is therefore a tension between rising political activity and increased enforcement, so that the relationship between per capita income and aggregate transfers is now ambiguous. Similarly, the hump-shaped relationship between inequality and transfers continues to hold only for "pure autocracies" where the decisive agent is not a militant, while in "mixed regimes" the relationship is now ambiguous [Proposition 6].

In Section 5 we look at the dynamic implications of the model. Since in highly unequal and poor countries there is little political activity, the model provides an argument by which in poor countries high levels of inequality can be *good* for growth; nonetheless, it also suggests that with continued growth highly unequal countries eventually face significant redistributive pressures. Indeed, in rich countries where agents are not constrained in their level of political activity redistribution is such that eventually the wealth distribution converges to full equality irrespective from the enforcement level.

We conclude by analyzing the empirical relationship between inequality and transfers for various samples of countries. We proxy for transfers using public spending in education (we also look at government expenditure, since the model predicts that in pure autocracies they peak too at intermediate levels of inequality). Consistent with previous studies - and in accordance with the model - we do not find any relationship for democratic regimes, while for autocracies we do find that transfers and government expenditure peak at intermediate levels of inequality.

We draw two lessons from this analysis. First, the model offers a plausible description of redistributive mechanisms in autocratic regimes. Second, to the extent that social conflict drives redistribution in democratic regimes, the model provides an explanation to the fact that existing empirical analyses do not find a significant relationship between inequality and transfers in democracies.

The paper is organized as follows. The next Section discusses related literature; Section 3 presents a simple model of political activism; Section 4 endogenizes enforcement; Section 5 discusses the dynamics of the model; Section 6 presents the empirical evidence, and Section 7 concludes.

2 Related Literature

A large literature studies the relationship between inequality and redistribution by means of the median voter theorem. In most cases the models predict a positive association between inequality and redistribution (see, for instance, Meltzer and Richard, 1981, Bertola, 1993, Perotti, 1993, Alesina and Rodrik, 1994, and Persson and Tabellini, 1994). Unfortunately, empirical evidence does not seem to support the relationship. For instance, Perotti (1996) regresses various indicators of redistribution on inequality, but finds little evidence that inequality affects redistribution. Rodriguez (1999a) seeks more accurate evidence using higher quality data for US states, but finds little evidence as well. Similarly, Bénabou (1996) surveys ten studies regressing redistribution on inequality, but only one out of ten finds a positive relationship. An exception is represented by Milanovic (2000), who computes inequality coefficients in pre-tax income for 23 countries from household surveys. In contrast with most studies he does find a positive association between inequality and redistribution; nonetheless, the sample includes an overwhelming proportion of rich democracies. To be sure, more sophisticated theoretical models suggest that inequality can have a negative impact on redistribution. This is for instance the case if we consider social mobility (Quadrini, 1999, Bénabou and Ok, 2001), if inequality stimulates rent-seeking (Rodriguez, 1999b), or if agents at the bottom of the income distribution are less politically active (Bénabou, 2000). Nonetheless, at the empirical level the relationship remains unclear for democracies, and to the best of our knowledge no study tests whether it is nonlinear in nondemocracies.

The literature on the political economy of social conflict is also flourishing. Among others, Mueller and Seligson (1987) and Alesina and Perotti

(1996) find a positive association between inequality and political instability. The hypothesis that inequality stimulates social conflict, which in turn increases redistributive pressures, has also been used to explain the extension of the franchise (Acemoglu and Robinson, 2001), land reforms (Huntington, 1968, Horowitz, 1993, and Grossman, 1994), or to study the optimal allocation of time between production and insurrection activities (see, among others, Grossman, 1991, and Hirshleifer, 1991a). Recent theoretical studies have also analyzed the relationship between various forms of inequality, conflict technologies, and the decision to engage into conflict (see, for instance, Hirshleifer, 1991b, Skaperdas, 1992, Esteban and Ray, 1999, and Robinson, 2001).

At the same time, poverty appears to prevent conflict. For instance, Lazarsfeld et al. (1933) observe a negative association between poverty and memberships to political parties; Huntington (1968) analyzes the relationship between political stability and economic development in India, and finds that violence is less likely to erupt in poorer states; there is also strong evidence that people at the lower tail of the income distribution vote less frequently (see, among others, Frey, 1971, Wolfinger and Rosenstone, 1980, and Rosenstone and Hansen, 1993). Recent theoretical work does incorporate the fact that people at the bottom of the income distribution are less politically active (Bénabou, 2000), or that poorly educated agents exhibit similar propensities (Bourguignon and Verdier, 2000). Nonetheless, none of them draws a clear distinction between poverty and inequality.

Finally, close to our analysis are also studies on the accumulation of wealth under the appropriation of resources by interest groups (see, for instance, Lancaster, 1973, Tornell and Velasco, 1992, and Benhabib and Rustichini, 1996). In particular, Benhabib and Rustichini (1996) consider a game where appropriation can be reduced by the use of trigger strategies, instead of enforcement. However, to the best of our knowledge no model considers the joint effects of inequality and poverty.

3 A Simple Model of Political Activism

The economy consists of N different groups of agents. Each group, of size one, is characterized by a level of capital holdings k_i, $i \in [1, \ldots, N]$, and uses a production technology specific to the capital level k_i. To each type is also associated a given interest group (or *coalition*) which defends the interests of agents with equal capital holdings.

The life of an agent lasts one period, and has two phases. In the first phase, as in Grossman (1991), agents allocate one unit of time between production and political activity but do not derive any utility from consumption. More precisely, we assume that the production function for an agent endowed with capital k_i is the following:

$$y_i = Ak_i [1 - I_i] \tag{1}$$

where I_i represents the time an agent from coalition i spends in political activity. We interpret production as if each agent were the manager of her own firm, and, in order to obtain the "full product" of their capital, agents had to work full time. In the second phase agents consume and bequeath out of their income, which is equal to the gains from production and political activity minus taxes paid. Like Banerjee and Newman (1993) and Piketty (1997), we assume that utility takes a Cobb-Douglas form over consumption and bequests: $U(c, b) = c^{1-s} b^s$, so that the savings rate is constant and equal to s. A bequest represents then the initial capital holdings of the new generation of entrepreneurs: $b_t = k_{t+1}$.

Political activity also entails a fixed cost of C consumption units that agents have to pay, and thus produce, during the first phase. The fixed cost captures additional expenses required for political activity, such as a minimal level of education, organizational investments, or indirect costs stemming from discrimination due to political activity.[6] In an alternative interpretation I can also be seen as the *intensity* of political activity instead of time, where the costs of political activity are proportional to the capital holdings of an agent: $C(I) = C_0 + Ak \cdot I$. Under either interpretation, agents engaging in political activity face the additional constraint that production in the first phase ought to be at least equal to C units:

$$Ak_i [1 - I_i] \geq C \tag{2}$$

We call (2) the *cost constraint*. To simplify the analysis we also assume that within a coalition agents provide equal amounts of time in political activity, and that any member of the coalition can force every other member to provide the chosen level of political activity. The second assumption ignores the well-known enforcement problem (Olson, 1965), but allows us to narrow down the problem.

We now turn to the benefits of political activity. We assume that if a coalition spends I units of time in political activity, each individual of

[6] To be sure, part of those costs are proportional to the time spent in political activity; nevertheless, to the extent that variable costs can be deducted from the subsequent rewards we only need to consider the fixed portion, which is tied to the absolute wealth level.

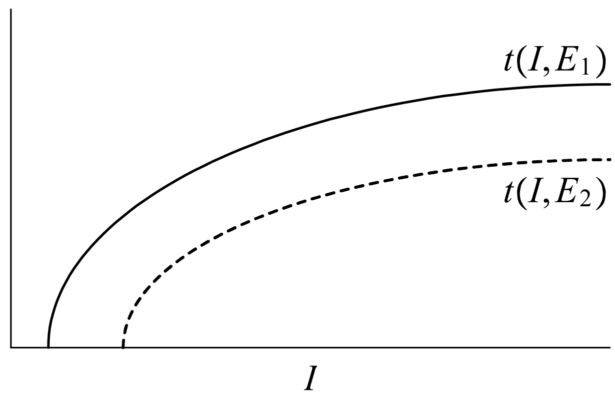

Figure 1: Transfer function for $E_2 > E_1$.

the coalition receives a transfer $T(I, E, K)$, where K is the average capital holdings of society over the N coalitions and E is the enforcement level, which can be interpreted as the degree of state resistance to political activity. In contrast with micro-founded models of special interests politics (see Grossman and Helpman, 1996, or Esteban and Ray, 2003), transfers do not depend on the intensity of political activity of other coalitions. In this aspect the model recalls the tragedy of the commons, with the difference that in a "general equilibrium" context aggregate transfers can still be regulated by varying the enforcement level E: indeed, as Figure 1 shows, higher enforcement levels reduce returns from political activity. *How* enforcement is chosen determines then the type of political regime (see next section for details); however, in this section we shall keep enforcement constant.

To avoid scale effects arising from the "transfer technology" alone, we also presume that T may be written as:

$$T(I, E, K) = K \cdot t(I, E) \tag{3}$$

so that $t(I, E)$ may be thought of as a *fraction* of societal wealth removed for the purpose of redistributive transfers. We also assume that $t(I, E)$ is increasing and concave in I, and decreasing and convex in E.

Thus, at the beginning of the second phase an agent belonging to a coalition with per capita holdings k, who devotes I to that coalition's political activity, and who is taxed by the state on asset holding at rate τ, will have a net wealth of:

$$\varphi(I, E, k) = Ak(1 - I) + K \cdot t(I, E) - \tau k - C \cdot 1_I \tag{4}$$

where 1_I is an indicator function equal to 1 if $I > 0$, and 0 otherwise. We presume that this is precisely the wealth level that an agent seeks to maximize by choice of I.

To complete the description of the model we must relate taxes paid to transfers received. To this end, denote by $I(E,k)$ the extent of (per person) activity carried out by a coalition with per capita assets k when the enforcement level is E. Suppose, further, that the cost of enforcement E is given by a function $H(E,K,N)$. Then government budget balance demands that:

$$\tau \cdot (NK) = NK \int t(I(E,k), E)\, \Delta(k)\, dk + H(E,K,N) \qquad (5)$$

where the income distribution $\Delta(k)$ has mass points equal to $1/N$ for $k = k_i$. Now, the reason that H depends on K is that enforcement presumably relies on human input, the return to which will rise proportionately with K. We wish to retain scale-invariance here as well, so we assume that $H(E,K,N) = NK \cdot h(E)$, where $h(E)$ is increasing and convex in E.

The three equations - (2), describing the cost constraint, (4), describing individual net wealth, and (5), describing budget balance - are fundamental to all the results in this paper.

Finally, note that the enforcement level E may act on transfers in two different manners: through a *level effect* that reduces transfers, but also trough a *distortionary effect* that varies the returns from political activity. In fact, the distortionary effect arises both from the cross derivative of the transfer function and from a change in the number of groups that find advantageous to be politically active. For simplicity we only consider the second distortion, and assume that $t_{IE} = 0$. Furthermore, to secure the feasibility of the equilibrium level of redistribution we need to guarantee that every agent has net positive wealth in the second phase. We therefore also assume that $t(I,E) \leq \bar{t} < 1\ \forall I, E$. In the Appendix we prove that the assumption suffices to guarantee positive net wealth in the second phase to every agent (TP 1).

3.1 Equilibrium Political Activity

We first characterize the relationship between individual wealth and political activity for a given level of enforcement E. During the first phase agents only seek to maximize their net income in the second phase, so that the maximization problem of a coalition with per capita holdings k is equal to:

$$\max_I K \cdot t(I,E) - Ak \cdot I - C \cdot 1_I \qquad (6)$$

$$s.t.$$

$$Ak \cdot (1 - I) \geq C \cdot 1_I$$

The solution to the optimization problem indicates that the optimal intensity of political activity follows an inverted-U relationship with respect to wealth:

PROPOSITION 1 *The optimal intensity of political activity is characterized by the following relationship:*

$$I(k,E) = \begin{cases} 0 & k < \underline{k},\ k > \overline{k} \\ 1 - \frac{C}{Ak} & \underline{k} \leq k < \widetilde{k} \\ t_I^{-1}\left(\frac{Ak}{K}, E\right) & \widetilde{k} \leq k \leq \overline{k} \end{cases} \tag{7}$$

where $\widetilde{k}$ is obtained by equalizing the last two expressions in (7), $\overline{k} \geq \underline{k}$ is defined by $\varphi\left(I, E, \overline{k}\right) \geq \varphi\left(0, E, \overline{k}\right)$, and $\underline{k} \geq C/A$ is characterized by $\varphi\left(I, E, \underline{k}\right) \geq \varphi\left(0, E, \underline{k}\right)$.

Figure 2 illustrates the optimal level of political activity: at low levels of wealth the opportunity costs of political activity are low, but agents face the cost constraint. Thus, as agents become richer they spend more time in political activity. On the other hand, at high levels of wealth the cost constraint is not binding but opportunity costs increase, so that political activity decreases. Figure 2 also shows that political activity is a discontinuous function of wealth since agents that are politically active incur an additional cost of C units. The inverted-U shape of political activity is the source of most of our future results.

Given the shape of equilibrium political activity we classify agents in three groups. First, there are *constrained agents* who cannot be as politically active as they desire because of the cost constraint. Wealthier than constrained agents are *unconstrained agents*, who are not subject to the cost constraint but are still politically active. Finally there are *rich agents*, who are not active because the opportunity costs of political activity are higher than the benefits.

While constrained agents are limited in their level of political activity by an *absolute* wealth constraint, the intensity of political activity of unconstrained agents only depends on their *relative* wealth level k/K. Furthermore, because unconstrained agents are able to increase their political activity if they find it optimal, we shall also refer to them as the *middle*

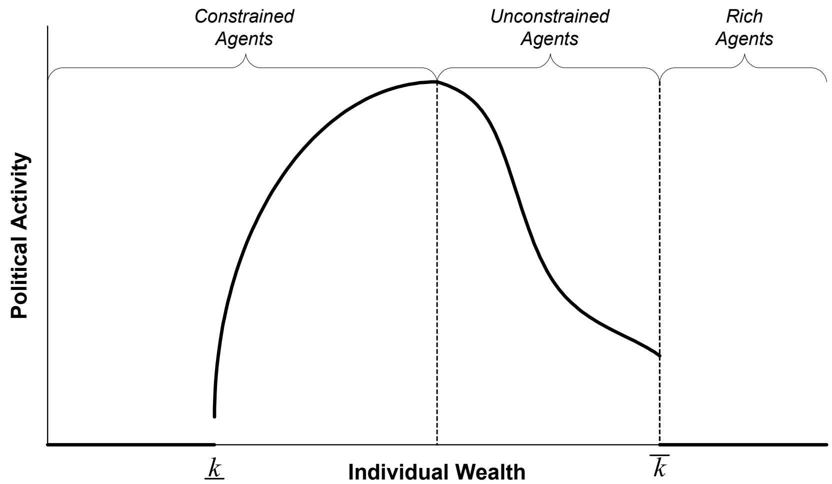

Figure 2: Optimal intensity of political activity.

class. Finally, note that the restriction on the cross derivative $t_{IE} = 0$ implies that for coalitions in the interior of $\left[\underline{k}, \overline{k}\right]$ we have that $I(k, E) = I(k)$; nonetheless, the boundaries $\underline{k}(E)$, $\overline{k}(E)$ do vary with enforcement. Next, we investigate some implications of the inverted-U shape of political activism conditional on the enforcement level E.

3.2 Winners and Losers

Only some agents are active, but all of them have to pay taxes: therefore, under proportional taxation only agents that are the most politically active benefit in net terms from overall political activity:

PROPOSITION 2 *If the tax burden is sufficiently low, there exist* $k^*(E, \Delta) > \underline{k}$ *and* $k^{**}(E, \Delta) < \overline{k}$ *such that:*

$$\begin{aligned} \varphi(E, k) &< Ak \qquad \text{for } k < k^* \text{ and } k > k^{**} \\ \varphi(E, k) &> Ak \qquad \text{for } k^* < k < k^{**} \end{aligned} \tag{8}$$

Figure 3 illustrates Proposition 2. Our result depends on the fact that taxation is proportional: if taxation were progressive enough only the rich would be worse off, while under regressive taxation, as it is often the case in developing countries, the poorest agents may be the only losers.

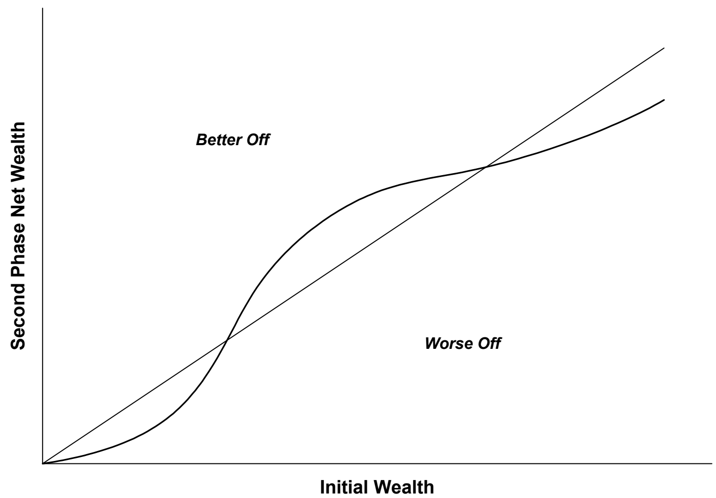

Figure 3: Net wealth after taxation and transfers with respect to initial wealth.

3.3 Transfers and Per Capita Income

In the model the only costs that is not scale invariant is the fixed cost C necessary to engage in political activity. Consequently, for a given income distribution as K increases constrained agents increase their political activity because they need less production time to satisfy the cost constraint.[7] *Aggregate political activity increases therefore with per capita holdings* K, so that aggregate transfers also increase with K (both in absolute terms, and as a proportion of K).

Figure 4 illustrates aggregate transfers. When coalitions of inactive agents become politically active aggregate transfers increase discontinuously; thereafter, transfers continuously increase until a new coalition becomes active. Finally, when no coalition faces the cost constraint anymore, transfers turn out to be a constant proportion of K.

3.4 Transfers and Inequality

Because of the inverted-U shape of political activity the effects of exogenous changes in inequality on aggregate transfers depend on the specific Dalton

[7] Some rich agents may also become active, since the fixed cost C represents a decreasing proportion of their wealth.

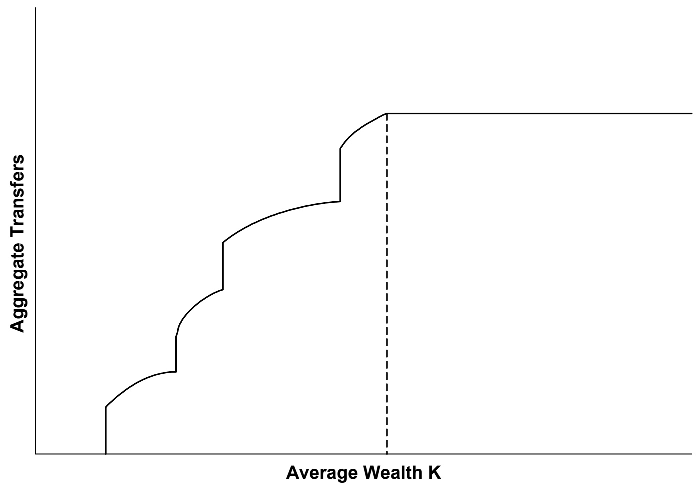

Figure 4: Aggregate Transfers vs. K for a given level of enforcement E.

transfer, or "wealth movement" that characterizes the change in inequality. More precisely, while wealth movements within constrained and unconstrained types of agents have ambiguous effects on transfers,[8] movements of wealth *across* types have clear implications:

1. *Wealth moves from unconstrained to rich agents.* In this case, as Figure 2 shows, aggregate transfers *increase* because unconstrained agents become more active.

2. *Wealth moves from constrained to rich agents.* In this case aggregate transfers *decrease* because constrained agents become less active.

3. *Wealth moves from constrained to unconstrained agents.* Here too, aggregate transfers *decrease* since both groups become less active.

We characterize next the relationship between inequality and transfers by means of those three types of wealth movements. First, notice that if there are sufficiently many coalitions aggregate transfers cannot peak at the limiting wealth distributions of full equality and full inequality. Indeed, under full equality a high enough wealth movement from the middle class

[8] More precisely, the relation between inequality and redistribution depends on the convexity/concavity of equilibrium transfers, which, in turn, depends on the third derivative of the transfer function.

to a single coalition increases aggregate transfers, and under full inequality any sufficiently high movement of wealth from the rich to constrained agents also increases transfers. Furthermore, we shall also presume that increases in inequality are associated with wealth movements from unconstrained to rich agents at low levels of inequality, and with wealth movements from constrained to rich agents at high levels of inequality. This assumption captures the fact that equal societies are empirically associated with a large middle class, while highly unequal societies are highly polarized and have a smaller middle class. Aggregate transfers peak therefore at intermediate levels of inequality:[9]

PROPOSITION 3 *For given per capita holdings K aggregate transfers peak at intermediate levels of inequality.*

3.5 Lobbying

Under militancy agents need to invest their own time: nonetheless, rich agents can engage into *lobbying* and invest capital instead of time. In this section we show that lobbying affects the level of aggregate transfers, but not necessarily the relationship between transfers, per capita income, and inequality.

To this end, we assume that coalitions have the possibility to hire agents external to the economy to exert political activity on their behalf; lobbyists then invest *their own time* in political activity. In particular, if a coalition hires a measure L of lobbyists to engage in political activity returns to the coalition are then equal to $K \cdot t\left(I_L, E\right)$, where $I_L = \int_0^L I\left(i\right) di$. To be sure, the manner in which lobbyists spend their time is different from how coalitions directly exert political activity; to simplify notation, however, we presume that returns are the same. We also assume that lobbyists are drawn from agents with wealth αK, where $\alpha \in [0, \infty)$, so that the costs of lobbying activities I_L are equal to $\alpha K \cdot I_L + C$.

In equilibrium only coalitions with capital holdings $k \geq \alpha K$ opt for lobbying, and (if they are not constrained in the amount they can invest) they choose an optimal amount of lobbying equal to $I_L = t_I^{-1}\left(\alpha\right)$. Note that I_L does not depend on the coalition's wealth k, since members of the coalition only invest capital, and not their own time. As illustrated in Figure 5, this

[9] Formally, there is also the possibility that under full equality all agents are constrained or inactive; nonetheless, to the extent that at intermediate levels of inequality some agents belong to the middle class, the statement remains valid.

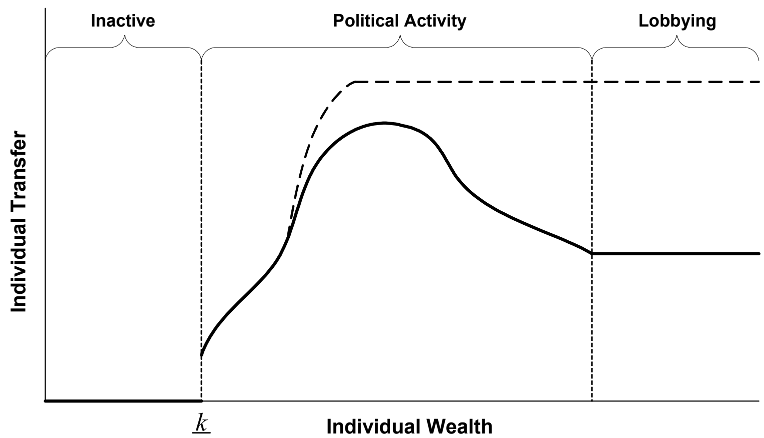

Figure 5: Political activity vs. lobbying.

implies that whenever the capital holdings of lobbyists are from the unconstrained domain individual transfers still follow an inverted-U shape. On the other hand, if the capital holdings of lobbyists are from the constrained domain then transfers initially increase but do not decrease anymore. Finally, if lobbyists have capital holdings from the rich domain we should not observe any lobbying in equilibrium.

Aggregate transfers increase therefore with per capita holdings K, since both political activity and lobbying increase. Moreover, to the extent that lobbying is expensive enough aggregate transfers also peak at intermediate levels of inequality. Indeed, when wealth moves from unconstrained to rich agents transfers increase; on the other hand when wealth moves from constrained to rich agents the latter do not increase their lobbying investment, so that transfers decrease.

4 Endogenous Enforcement

We now distinguish between types of political regimes by assuming that the government has the power to regulate aggregate transfers by means of *enforcement*, which can be interpreted as a measure of how much a government resists redistributive pressures.

More precisely, drawing from the voting literature we assume that enforcement is chosen by a *decisive agent*. We do not necessarily think of the decisive agent as a "median voter" in any democratic mechanism, though this interpretation is not excluded. Just *who* is decisive is, in a way, a reflection of the political and economic structure of the society in question.

Note that how much the decisive agent wants to resist redistribution depends on the net benefits of her personal political activity which, in turn, depend on her relative wealth level k/K. We therefore rank agents with respect to their wealth, and link the type of political regime to the rank in society of the decisive agent. We also presume that the decisive agent is either from the unconstrained or rich domain.

In particular, we say that the more the wealth of the decisive agent is large with respect to median wealth the more a society becomes "autocratic". In fact, to characterize the relationship between per capita income, inequality and aggregate transfers we only need to define two classes of political regimes: *mixed regimes*, where the decisive agent is politically active, and *pure autocracies*, where the decisive agent is a rich agent. The incentives of the decisive agent to resist redistribution differ between the two types of regimes. Indeed, in mixed regimes the first order condition is equal to:

$$k\frac{\partial \tau}{\partial E} = K\frac{\partial t}{\partial E} \tag{9}$$

where the LHS represents marginal gains from lower taxation rates, and the RHS represents marginal losses due to lower private transfers.[10] In mixed regimes the decisive agent faces therefore a tradeoff between taxes and redistribution, so that the equilibrium tax rate is not minimized: $\tau_E < 0$. On the other hand, in pure autocracies the decisive agent is inactive and thus only wants to minimize the tax burden, so that the first order condition (9) reduces to $\tau_E = 0$.

The FOC (9) also suggests that enforcement is an increasing function of the wealth of the decisive agent. Indeed, while returns to political activity are proportional to average wealth taxes are proportional to individual wealth; consequently, richer agents benefit less from political activity and prefer a lower tax burden, which is achieved by increasing the enforcement level E:

PROPOSITION 4 *For a given income distribution and levels of per capita holdings K the equilibrium enforcement level increases with the wealth of the decisive agent. Consequently, ceteris paribus pure autocracies have higher enforcement levels, lower government expenditure and redistribute less than mixed regimes.*

[10] Note that, due to the fixed cost C, derivatives do not necessarily exist. However, we shall use them for illustrative purposes and leave the formal proofs in the appendix.

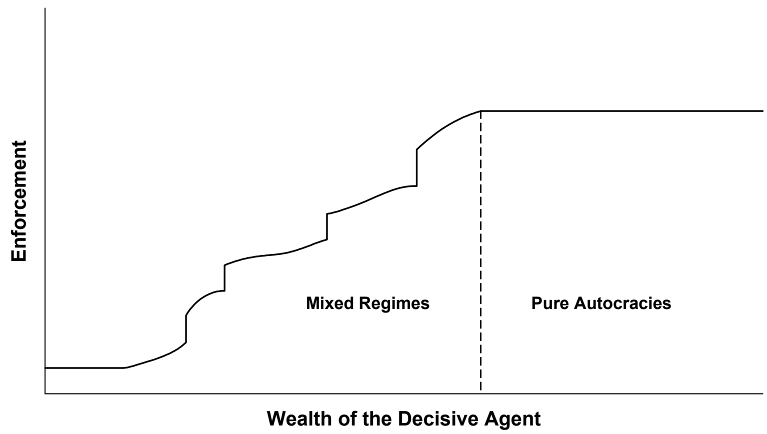

Figure 6: Equilibrium enforcement level.

Figure 6 illustrates some characteristics of equilibrium enforcement. First, unconstrained agents with income below average can find optimal to choose $E = 0$, because most of the tax burden is supported by richer agents. Second, rich agents only seek to minimize the tax burden: consequently, the enforcement level remains constant. Finally, optimal enforcement is unique but presents some discontinuities. In particular, there exist wealth levels where the decisive agent is indifferent between having j groups of active agents, and spending more in enforcement so that only $j' < j$ groups remain active.

Next, we return to the exercise of studying redistribution when there are exogenous changes in per capita holdings and inequality. First, we study the relationship between enforcement and per capita holdings; we then use the results to discuss the relationship between aggregate transfers and per capita holdings. Finally, we repeat the exercise for inequality and transfers.

4.1 Enforcement and Per Capita Income

In this section we study how enforcement reacts to changes in per capita holdings K assuming that the overall wealth distribution and the relative wealth level k/K of the decisive agent remain constant. Recall that, *for a given enforcement level* E, the number of politically active agents increases with K. As a result, when K increases we would expect that the decisive agent raises enforcement as well, because it becomes more efficient in reducing the tax burden. Although the basic intuition is correct we shall see that the exact relationship is more subtle.

Indeed, enforcement also *discourages* inactive coalitions to become active, and when it loses its deterrence function it *decreases* discontinuously. To see this, assume that at average holdings K_0 a new coalition enters. Denote by E_{out} the minimal enforcement level that deters entry at K_0, and by $E_{in} \leq E_{out}$ the optimal enforcement level if the new coalition is active. At K_0 the decisive agent is indifferent between keeping the new coalition inactive and allowing the new coalition to engage in political activity: therefore, $\varphi(E_{in}) = \varphi(E_{out})$, which implies that $E_{out} > E_{in}$.

Nonetheless, enforcement can only decrease when new coalitions become active, while, *on average*, it increases. To formalize this intuition we now define a lower bound for the equilibrium enforcement level, and show that the lower bound is an increasing function of K.

To this end, we characterize two different types of coalitions as follows. At every K, vary infinitesimally the equilibrium enforcement level $E(K)$ to $E(K) - \varepsilon$. Coalitions that are not active at $E(K)$ but that would be active at $E(K) - \varepsilon$ represent *threat coalitions*, since the enforcement level needs to remain at $E(K)$ to keep them out. Furthermore, artificially "make" a threat coalitions inactive for any level of enforcement but keep everything else (including average holdings K) constant. Compute then the new equilibrium enforcement level, and repeat the process until no threat coalition remains (note that during the process some coalitions may become threat coalitions, and inactive coalitions may become active). The new number of active coalitions represents the number of *core coalitions*, and we denote the respective equilibrium enforcement level as *core enforcement*.

Finally, we say that the economy is in a *threat zone* if there is at least one threat coalition, and in a *core zone* otherwise. In other words, the economy is in a core zone whenever coalitions that are not active have wealth level sufficiently below $\underline{k}(E)$ or above $\overline{k}(E)$ so that the decisive agent takes locally the number of active coalitions as given. The next proposition states that the core enforcement level is an increasing function of K, and represents a lower bound of equilibrium enforcement:

Proposition 5

1. *The equilibrium enforcement level is strictly higher than core enforcement in threat zones, and equal to core enforcement in core zones.*

2. *The number of active coalitions is equal to the number of core coalitions in core zones, and lower or equal in threat zones.*

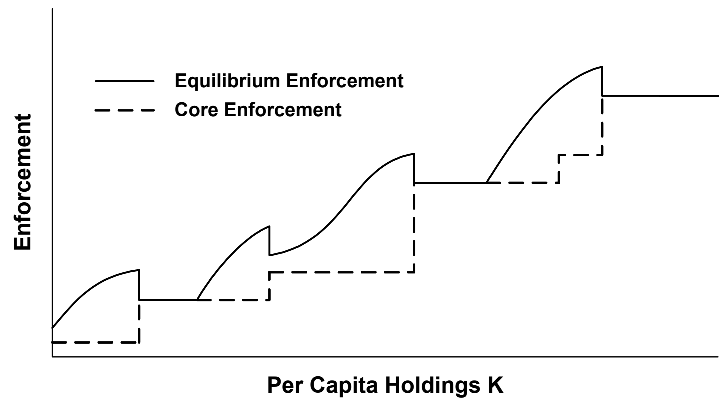

Figure 7: Equilibrium and core enforcement levels.

3. *The core enforcement level and the number of core coalitions are increasing step functions of K.*

The relationship between optimal enforcement and per capita income is depicted in Figure 7. In threat zones the decisive agent prefers to avoid the entrance of inactive coalitions and increases therefore the enforcement level. Eventually, however, keeping coalitions out becomes too expensive so that the enforcement level discontinuously drops. After the drop the economy is either in a core zone, where no coalition has incentives to enter, or again in a threat zone, where enforcement increases to avoid entrance of a new coalition.

Similarly, the number of active coalitions does not necessarily increase with K since in threat zones higher enforcement levels could drive some active coalitions out. Nonetheless, in light of the results of Proposition 5 *on average, the enforcement level and the number of active coalitions are increasing functions of per capita holdings K.*

4.2 Transfers and Per Capita Income

Under endogenous enforcement aggregate transfers do not necessarily increase with per capita holdings K. Indeed, both the enforcement level and aggregate political activity tend to increase with K, so that the net effect on transfers remains ambiguous. Nonetheless, in pure autocracies the decisive agent always minimizes the tax burden, so that government expenditure, but not necessarily transfers, always increases with K.

To clarify the point we present next an example that illustrates the behavior of government expenditure under mixed regimes, and we prove that under pure autocracies expenditure increases with K.

Mixed regimes Consider the case of a very polarized society with only two groups, where the poorer group has wealth k and the richer group (to which the decisive agent belongs) has wealth ψk, with $\psi > 1$. In this context we analyze the intensity of political activity for two levels of average capital holdings, one for which only the richer coalition is active ($\xi(K_1) = 1/2$), and the second for which both coalitions are active ($\xi(K_2) = 1$), where ξ represents the proportion of active coalitions. Consider, also, the following transfer function:

$$t(I, E) = \begin{cases} \max\{F - \lambda E^{\alpha}, 0\} & I \geq I_0 \\ 0 & else \end{cases} \tag{10}$$

and assume that $h(E) = E$. The utility of the decisive agent is thus equal to:

$$\varphi(I, E, k) = (1 - I_0) k + K \cdot (F - \lambda E^{\alpha}) - \tau k - C \tag{11}$$

where the tax rate is equal to $\tau = \xi \cdot (F - \lambda E^{\alpha}) + E$. Figure 8 presents the equilibrium tax rate τ, which corresponds to the share of government expenditure in K, for some specific parameter values.[11] It shows that for small values of λ the tax burden is higher when all agents are politically active ($\tau(1) > \tau(1/2)$); on the other hand, as enforcement becomes more effective (that is, λ increases) it becomes cheaper for the decisive agent to give up private transfers but to decrease the tax burden. Therefore, in spite of higher political participation, in mixed regimes government expenditure can *decrease*.

Pure Autocracies Under pure autocracies the decisive agent seeks to minimize the tax burden for any level of per capita holdings K. Since aggregate political activity tends to increase with K, government expenditure has to increase with K as well. The formal proof is straightforward. Rewrite the maximization problem of rich agents as $\tau(E, K) = \min_E G(E, K)$, where $G(E, K) = \int t(E, K) + h(E)$ represents government expenditure. By the envelope theorem we then have that $d\tau/dK = \partial\tau/\partial K \geq 0$.

[11] More precisely, we have assumed that $A = 1$, $I_0 = 0.1$, $F = 0.5$, $\alpha = 1/3$, $C = 0.1$, $\psi = 10$, and that $k(\xi = 1/2) = 0.1$, while $k(\xi = 1) = 1$. Moreover, parameters are such that coalitions are either inactive or core coalitions.

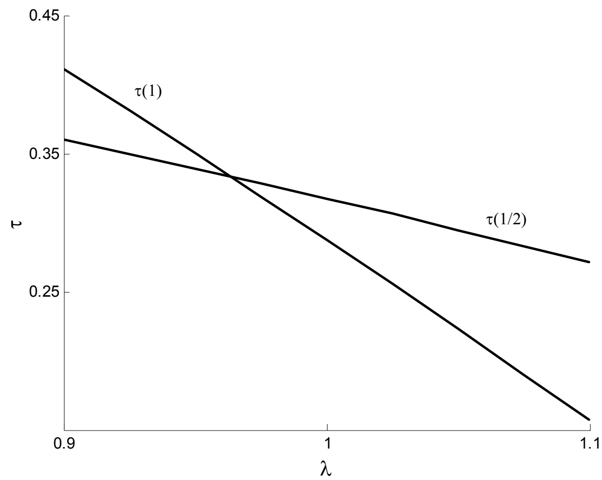

Figure 8: Tax rate for $\lambda = [0.9, 1.1]$.

4.3 Transfers and Inequality

Under endogenous enforcement the relationship between inequality and transfers continues to hold unambiguously only in pure autocracies. Indeed, for a given political regime enforcement tends to vary with inequality, because (for a given rank) the relative wealth level k/K of the decisive agent also varies. There is therefore a tension between changes in the enforcement level and changes in aggregate political activity, so that the relationship between aggregate transfers and inequality remains a priori ambiguous.

Nonetheless, in pure autocracies aggregate transfers still peak at intermediate levels of inequality. Indeed, in pure autocracies enforcement is set to minimize the tax burden and does not depend on the wealth the decisive agent (as long as the decisive agent remains inactive in her own sphere). At low inequality levels enforcement tends therefore to remain constant, so that the logic of the previous section applies and aggregate transfers increase with inequality.[12] On the other hand, at high inequality levels most agents are constrained irrespective from the enforcement level, so that aggregate transfers decrease with inequality:

Proposition 6 *In pure autocracies aggregate transfers and government*

[12] The statement is formally correct only if there are no threat coalitions. Nonetheless, the analysis is easily extended to threat coalitions along the lines of the previous section.

expenditure peak at intermediate levels of inequality.

The proof for government expenditure goes along the same lines as for transfers. Note, also, that *under full equality agents can either be inactive or unconstrained, but not constrained*. Indeed, constrained agents do not produce at all, so that under full equality it is never optimal for the decisive agent to let constrained agents be active. Nonetheless, to the extent that in poor economies some coalitions are active at intermediate levels of inequality, Proposition 6 remains valid.

5 Dynamic Implications

In what follows we discuss two relevant dynamic implications of the inverted-U relationship of political activism: the relationship between inequality and growth, and the dynamics of the income distribution.

To this end, we make first an additional assumption on the transfer function in order to guarantee that the ranking of the agents with respect to wealth is maintained across time. This is not necessarily the case in the model because taxes are paid proportionally to initial capital holdings, so that highly active agents with low initial capital holdings may be better off in the second phase than less active agents with higher initial capital holdings. To exclude this case we assume that $t_I \left(1 - \bar{t}/A, .\right) = 0$, which guarantees that in equilibrium there is no leapfrogging among agents (TP 2).

5.1 Inequality and Growth

The growth rate of average capital holdings is equal to:

$$\rho_t = \frac{K_{t+1}}{K_t} = s\left\{A - h\left(E_t\right) - \frac{1}{K_t}\int l\left(k\right)\Delta_t\left(k\right)dk\right\} \tag{12}$$

where $l\left(k\right) = Ak \cdot I\left(k\right) + C \cdot 1_I$ represents production losses that agents incur because of their political activity. Two factors can therefore reduce growth: enforcement spending and production losses.[13] Recall, also, that at high inequality levels there is little political activity and enforcement spending is low, so that independently from the type of political regime growth rates are high:

[13] To be sure, to the extent that redistribution entails deadweight losses due to taxation it also reduces growth; nonetheless, aggregate transfers follow a pattern similar to production losses, and for simplicity we only consider the latter.

Proposition 7 *At low levels of per capita holdings K highly unequal countries face high growth rates. Eventually, however, they will face high redistributive pressures and low growth rates.*

In contrast with recent models based on credit constraints (Galor and Zeira, 1993) Proposition 7 provides therefore an argument by which inequality can be *good* for growth. Nonetheless, as Proposition 7 states, eventually highly unequal countries face high redistributive pressures and low growth rates. Indeed, in highly unequal economies taxation is low; therefore, the poor cumulates resources and eventually becomes active, so that either production losses or enforcement spending increase.

5.2 Unconstrained Economies

To conclude we characterize the dynamics of economies where no coalition is constrained in its level of political activity (we denote such economies as *unconstrained economies*). Due to the clear predictions of the model for that case we focus attention on economies that remain unconstrained at every period.[14] Indeed, if an economy remains unconstrained the wealth distribution converges towards full equality independently from the wealth of the decisive agent; consequently, enforcement levels and growth rates converge as well:

Proposition 8 *If an economy is unconstrained for all $t \geq t_0$ the income distribution converges to full equality, the enforcement level to a constant level E_∞, and growth towards a constant growth rate ρ_∞.*

Note that Proposition 8 does not guarantee that any unconstrained economy converges towards full equality; indeed, there could exist cases where some unconstrained agents eventually become constrained again because of high tax burdens. Nonetheless, Proposition 8 does provide an explanation to the empirical fact that among rich countries inequality levels and government expenditure are less dispersed than among developing countries. Furthermore, it also suggests that in highly unequal economies political activity initially increases as the economy develops, but eventually decreases because inequality tends to decrease as well.

[14] This is for instance always the case if the productivity of capital A is high enough.

6 Empirical Evidence

The theory classifies a political regime as *pure autocracy* when redistribution is not determined by a voting process and the coalitions in power are rich enough so that they only seek to minimize the tax burden. Under autocratic regimes the model predicts that both government expenditure and aggregate transfers peak at intermediate levels of inequality, while in mixed regimes, which empirically are more close to democracies, the relationship between inequality and transfers remains ambiguous. As we shall see, this appears to be consistent with empirical evidence.

6.1 Data Description

As a measure of transfers we consider public expenditure in education. It is, of course, not a perfect proxy of our definition of transfers, since education clearly benefits more than a single interest group. Nevertheless, to the extent that richer coalitions have access to private education, and to the extent that public education benefits more the middle class than the very poor, our variable remains a valid measure of transfers. There clearly exist other variables that can be good proxies for transfers, such as wages and public health expenditure. Unfortunately, when restricted to autarchic countries, we were not able to find sources with enough observations.[15]

Data on government expenditure and public expenditure in education are from the World Development Indicators 2002 (henceforth: WDI 2002), and we express both variables as a percentage of GDP. Furthermore, as a measure of inequality we use the Gini coefficients that Deininger and Squire (1996) classify as *accept*, which, despite many caveats (Atkinson and Brandolini, 2001) are currently the state-of-the-art data on income distribution for cross-country comparisons (see, for instance, Forbes, 2000, Easterly, 2001, and Banerjee and Duflo, 2003).

Serious thought has also to be given to the classification of the political regime of a country, since the selection of the sample of autocratic countries can strongly influence the empirical results. We therefore use two different indexes of autocracy. The first index (AUTOC I) is derived from Przeworski et al. (2000), which classify a country as autocratic if at least one of the following cases hold: the chief executive is not elected, the legislature is not

[15] The sources we tried to use for public health expenditure were limited to less than ten observations when restricted to autocratic countries (Easterly and Rebelo, 1993, and WDI 2002). The same holds for wage data (see, for instance, the dataset of Rama and Artecona, 2002).

elected, there is only one party, or parties do not alternate over time.[16] The second index (from Polity IV, 2000) varies from zero to ten. It considers the competitiveness of political participation, the regulation of participation, the openness and competitiveness of executive recruitment, and constraints on the chief executive. We have deemed autocratic those countries that have an average autocracy score higher than five over the half decade, and, in both indexes, we have excluded from the sample countries with socialist backgrounds. The correlation between the two measures is 0.6, and both entail approximately the same number of observations.

Summary characteristics of all variables are presented in Table 1, and Table 2 shows the correlation matrix. Note that autocracy and inequality are only slightly correlated, and that population below age 15 and public spending in education are actually *negatively* correlated. Moreover, in addition to the fact that in our model results for inequality are conditional on per capita holdings, Table 2 also shows that more unequal countries tend to be poorer, so that under all regression specifications we will be careful to correct for per-capita GDP.

Political instability and redistribution are also affected by other factors than per capita holdings and inequality: for instance, Easterly and Levine (1997) find that ethnic fractionalization has a strong impact on political stability and growth. We therefore also proxy for political factors using an index of political instability and military expenditure, which can also be thought of being associated with instability. To obtain the index of political instability we have followed the approach of Alesina and Perotti (1996), and combined the number of assassinations, the number of coups, and the number of revolutions per half decade using the method of principal components. The data on political instability are from Barro and Lee (1994), while the data on military expenditure are from Barro and Lee (1994) until 1985, and from the WDI 2002 for the subsequent years. We also add an index of ethnolinguistic fragmentation from the Altlas of Peoples of the World (*Atlas Narodov Mira*, 1964) that measures the probability that two randomly selected individuals in a country belong to different ethnolinguistic groups (see also Taylor and Hudson, 1972, Mauro, 1995, and Easterly and Levine, 1997). All the remaining data are from the WDI 2002.

[16] More precisely, we have given in each year the value 1 to a dummy variable if the country that year has been classified either as *Autocracy* or as *Bureaucracy*. We have then classified a country as autocratic if its half-decade average is higher than 0.7.

6.2 Estimation Method

We first run inequality-transfer OLS regressions for the full sample of countries, for democratic countries alone, and with the two samples of autocratic countries. In order to get rid of noise but to retain enough data points we follow the approach of Barro (1991), and take the average of every variable over a five-year period starting from 1960.

To begin with we treat each observation as independent, and compute t-statistics with White heteroskedasticity-corrected variances. We then correct for the fact that countries with more observations might drive the results, and weight each observation by the total number of observations of the country, and then cluster the errors by country. We do not present the results here because the significance of the Gini coefficients, as well as their order of magnitude, is almost equal to the non-weighted regressions. Furthermore, we address the issue that the error terms might follow an AR(1) process within each country. We therefore allow for AR(1) errors, as well as for heteroskedasticity across countries: although we do find a correlation among the error terms, we shall see that results do not change significantly. We have also run fixed effect estimations to address the issue of unobservables. However, we find that no variable (including the inequality coefficient and per-capita GDP) consistently affects transfers. Given the generally high measurement errors of the Gini coefficients (see, for instance, Atkinson and Brandolini, 2001), their high correlation across time, and the fact that fixed effect estimation exacerbates the measurement error bias, this outcome is not surprising.

Finally, we perform nonparametric estimations of the inequality-transfer relationship. More precisely, we estimate the following relationship:

$$Transfer = \beta \cdot GDP + \Phi\left(GINI\right) + \varepsilon \tag{13}$$

where $\beta \cdot GDP$ considers the influence of per-capita GDP on transfers, and $\Phi\left(GINI\right)$ is a function of the Gini coefficient. To consider possible correlations between GDP and $GINI$, we use an estimation method first proposed by Robinson (1988). More precisely, we first estimate nonparametrically $E\left[Transfer|GINI\right]$ and $E\left[GDP|GINI\right]$, subtract them from the respective variables, estimate then β using OLS, and finally estimate $\Phi\left(GINI\right)$ again nonparametrically (for more details, see Robinson, 1988). All nonparametric regressions are performed using locally weighted regressions and a tricube weighting function, and the 95% confidence interval has been bootstrapped. In the Appendix we also discuss potential biases due to the endogeneity of the inequality coefficients and to unobservables.

6.3 Government Expenditure and Inequality

The results for overall government expenditure are presented in Table 3. Regression (1) only contains basic variables; that is, GDP, GINI and the square of GINI. In regression (2) we add regional dummies, while in regression (3) we correct for the square of GDP, and also add the indexes of ethnic fractionalization and of political instability. All three regressions have been run for four samples each: with the full sample of countries, with democratic countries alone (we consider a country to be democratic if it has not been classified as autocratic by the Przeworski et al. (2000) index), and with each sample of autocratic countries. The results display interesting differences among the various samples. In the full sample of countries inequality does not seem to be significantly associated with transfers; nevertheless, at a more disaggregated level we can see significant differences between democracies and autocracies. In democratic countries transfers decrease at low levels of inequality and increase at high levels, but this relationship disappears when region-specific unobservables are included (regression 2): Latin America and South East Asia seem to drive the results. In contrast, in autocratic countries the relationship between transfers and inequality seems to be robust, and follows the opposite pattern: the ratio of transfers to GDP *increases* at low levels of inequality and *decreases* at high levels.

Curiously enough, per-capita GDP is significant both in the full sample regressions and in the regressions with only democratic countries, but tends to *lose* significance when the sample is restricted to autocratic regimes. Moreover, political instability and ethnic fractionalization do not seem to have a significant impact on government expenditure. Also note that, under autocratic regimes, the estimated transfer function tends to peak at a Gini coefficient between 0.44-0.49 irrespective of the regression specifications, suggesting that the estimated relationship between inequality and transfers is quite stable. We shall presently see that the transfer function peaks at a similar locus when we use public education expenditure as a proxy.

Table 4 presents the regressions with AR(1) errors. We actually do find that errors are correlated across time; however, we obtain very similar results. In all regressions, the Gini coefficients acquire significance only when restricted to the sample of autocratic countries, while per-capita GDP loses significance. The only relevant difference is that the inequality-transfer relationship appears to be less robust under the Polity IV index of autocracy: GINI and its square are significant only in one out of three regression specifications.

Finally, Figure 9 presents the graphical results of the nonparametric estimations. We can see that they basically confirm the results of ordinary least squares: under the full and democratic samples of countries there does not seem to be any significant relationship between inequality and transfers, while under both samples of autocratic countries the relationship tends to display an inverted U shape. However, for overall government expenditure we cannot exclude that the relationship between inequality and transfers is insignificant at the 5% level. Although it is possible that the strong significance of the OLS estimates are a consequence of the quadratic restrictions that we have imposed, other arguments also suggest that nonparametric estimations are likely to lead to less significant estimates. For instance, we were not able to correct for as many unobservables as in the ordinary least squares regressions, and we have bootstrapped the confidence intervals pointwise, such that we cannot test for joint significance.

6.4 Education and Inequality

Results for public spending in education are presented in Table 5. Regression (1) only contains per-capita GDP, GINI and its square; in regression (2) we have added demographic characteristics and regional dummies, while in regression (3) we have included demographic characteristics, the square of per-capita GDP, as well as political instability and ethnic fractionalization. Results in Table 5 are actually very similar to the ones obtained under government expenditure. Here as well, the Gini coefficients become significant at the 5% level only when regressions are restricted to the samples of autocratic countries, per-capita GDP tends to lose its significance under autocratic regimes, and ethnic fractionalization seems to have little impact on redistribution. Moreover, the transfer function also peaks at a Gini coefficient of 0.47-0.53.

Table 6 presents the results for the regressions with AR(1) errors. Despite the correction, we find that the signs, the orders of magnitude, and the significance of the Gini coefficients do not vary much with respect to the uncorrected estimates, although, in full similarity with government expenditure, results using the Polity IV sample of autocratic countries are not very robust.

Finally, the nonparametric estimations, presented in Figure 10, confirm our results. Note that the inverted U relationship appears to be much more pronounced, and we can exclude an insignificant relationship from the 95% confidence interval.

7 Conclusions

In autocratic regimes militancy is often the only form of political activity available to the poor. Therefore, if effective militancy entails some fixed cost the poor cannot rebel, and redistribution does not take place.

This appears to be consistent with cross-country evidence. There are, of course, other determinants of social conflict and redistribution, such as ethnic divisions or fights for natural resources: nonetheless, without considering the preventive effect of poverty on political activity it is difficult to explain the inverted-U relationship of redistribution with respect to inequality that also appears in the data for autocratic regimes.

The inverted-U relationship also entails some dynamic implications. In particular, it explains why poor and highly unequal countries such as Brazil and Mexico can have high growth rates - although it predicts that eventually those countries shall face high redistributive pressures.

Finally, our analysis also provides yet another reason why in democracies higher inequality levels do not necessarily imply more redistribution. Indeed, to the extent that social conflict stimulates redistribution in democracies, and to the extent that in democracies the decisive interest groups are politically active, the relationship between inequality and transfers remains ambiguous even at the theoretical level.

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8 Appendix

8.1 Technical Propositions

Technical Proposition 1 *In equilibrium every agent has net positive wealth:* $\varphi(I(k, E^*), E^*, k) > 0 \ \forall k$.

Proof. Note that optimality implies that for every agent wealth after political activity is higher than wealth without: $Ak(1-I)+Kt(I,E)-C \geq Ak$. Moreover, we also have that in equilibrium:

$$\int t(I(E^*, k), E^*) \Delta(k) \, dk + h(E^*) \leq t(1, 0) \tag{14}$$

since, if the LHS would be higher, any agent would be better off by not spending anything for enforcement, and obtaining more private transfers. Therefore, for any k the following holds:

$$\begin{aligned} \varphi(I, E^*, k) &= Ak(1-I) + Kt(I, E^*) - \tau k - C \\ &\geq Ak(1-\tau) \geq Ak(1 - t(1,0)) > 0 \end{aligned}$$

which proves the proposition. ■

Technical Proposition 2 *The ranking of the agents with respect to wealth is maintained across periods.*

Proof. Note that the ranking among agents that are not politically active is maintained. Moreover, Assumption 1 guarantees that $\tau \leq 1$, and Assumption 2 guarantees that $I \leq 1 - \bar{t}/A$, such that for unconstrained agents we have that:

$$\frac{d\varphi}{dk} = A(1-I) - \tau \geq A(1-I) - \bar{t} \geq 0 \tag{15}$$

On the other hand, for constrained agents we have that:

$$\frac{d\varphi}{dk} = A(1-I) - \tau + \left\{ Kt_I I_k - \frac{C}{Ak^2} \right\} > A(1-I) - \bar{t} \geq 0 \tag{16}$$

where the expression in brackets is positive because for constrained agents the marginal benefits of political activity exceed the marginal costs. Hence, the ranking among agents is preserved. ■

8.2 Proof of Proposition 2

Clearly, rich agents are worse off since they are not politically active, but still pay taxes. Next, we shall analyze the case of unconstrained agents, and denote the utility of an agent with wealth k as $Ak \cdot \vartheta(E,k)$: agents are thus better off if and only if $\vartheta(E,k) > 1$. Moreover, note that $\vartheta_k(E,k) = -\left[1/Ak^2\right]\{K_t t(I(k), E) - C\} < 0$, and that for agents close enough to rich agents $\vartheta(E,k) < 1$. Therefore, there must be an upper bound such that agents are worse off for all $k > k^{**}$. On the other hand, for constrained agents, we have that:

$$\vartheta_k(E,k) = \frac{K_t}{Ak^2}\left\{\frac{C}{Ak}t_I - t(I,E)\right\} \tag{17}$$

Note that the derivative of the expression in the brackets is positive for low levels of k, and negative for high levels. Therefore $\vartheta(E,k)$ is initially strictly increasing and then strictly decreasing with respect to wealth. The fact that $\vartheta(E,\underline{k}) < 1$ concludes the proof.

8.3 Proof of Proposition 4

In what follows, we shall rewrite $\varphi(E,k) = Ak \cdot \vartheta(E,k)$, and denote with E the optimal enforcement level for a given wealth level k. Moreover, we shall prove Proposition 1 by contradiction, and assume therefore that $k' > k$, but that $E' < E$. A simple revealed preferences argument also shows that the following has to hold:

$$\varphi(E,k) \geq \varphi\left(E',k\right); \ \varphi\left(E',k'\right) \geq \varphi\left(E,k'\right)$$

$$\Rightarrow F(E) \equiv \vartheta(E,k) - \vartheta\left(E,k'\right) \geq \vartheta\left(E',k\right) - \vartheta\left(E',k'\right) \equiv F\left(E'\right) \tag{18}$$

And therefore:

$$F(E) - F\left(E'\right) = \frac{K}{A}\left\{\left(\frac{t(E,k)}{k} - \frac{t(E,k')}{k'}\right) - \left(\frac{t(E',k)}{k} - \frac{t(E',k')}{k'}\right)\right\} \tag{19}$$

Also note that:

$$\frac{d}{dE}\left\{\frac{t(E,k)}{k} - \frac{t(E,k')}{k'}\right\} = t_E\left\{\frac{1}{k} - \frac{1}{k'}\right\} < 0 \tag{20}$$

and therefore, for $E' < E$ we have that $F(E) - F(E') < 0$, which contradicts (18). Moreover, note that $\tau(E') \leq \tau(E)$, since otherwise $(E, \tau(E))$ would dominate $(E', \tau(E'))$, a contradiction.

8.4 Proof of Proposition 5

Note that when we take out a threat coalition enforcement either remains constant, or decreases, so that the number of active coalitions can only increase. Therefore, core enforcement represents a lower bound, and core coalitions an upper bound. To characterize the core enforcement level, we can rewrite the FOC (9) as follows:

$$\left\{\frac{K}{k}-\xi\right\} t_{E_c}=h_{E_c} \tag{21}$$

where E_c represents core enforcement, and ξ represents the proportion of core coalitions. Consequenly, for a constant relative wealth level K/k and constant number of core coalitions ξ the enforcement level remains constant as well. Moreover, when ξ increases the convexity of t and h imply that optimal enforcement has to increase, and vice-versa.

Now we have to prove that in equilibrium core zones at higher K have higher enforcement levels. To do so, note that:

$$F\left(E_c'\right)\equiv\vartheta\left(E_c',K'\right)-\vartheta\left(E_c',K\right)\geq\vartheta\left(E_c,K'\right)-\vartheta\left(E_c,K\right)\equiv F\left(E_c\right) \tag{22}$$

Also assume that $K'>K$, but that $E_c'<E_c$. Then we have that:

$$\frac{dF}{dE_c}=\left\{\xi\left(E_c,K\right)-\xi\left(E_c,K'\right)\right\} t_{E_c} \tag{23}$$

Moreover, note that threat coalitions are coalitions that are not active, and that all coalitions that are active at E_c are also active at E_c', so that $\xi\left(E_c,K\right)\leq\xi\left(E_c,K'\right)$. Hence, $dF/dE_c>0$, a contradiction. Therefore, $E_c'\geq E_c$; using the FOC (21) we then obtain that the number of core coalitions has to be higher as well.

8.5 Proof of Proposition 8

We first prove that for any non degenerate income distribution and enforcement level E we have that $\overline{\varphi}\left(k\right)/\underline{\varphi}\left(k\right)<\overline{k}/\underline{k}$, where $\overline{k},\underline{k}$ represent the lowest and highest level of capital in the economy. To see this, note that:

$$\frac{\overline{\varphi}\left(k,E\right)}{\underline{\varphi}\left(k,E\right)}=\frac{\varphi\left(\overline{k},E\right)}{\varphi\left(\underline{k},E\right)}=\frac{\overline{k}}{\underline{k}}\cdot\frac{\vartheta\left(\overline{k},E\right)}{\vartheta\left(\underline{k},E\right)}<\frac{\overline{k}}{\underline{k}} \tag{24}$$

where we have used the fact that the ranking among agents is preserved, and that $\vartheta_k\left(k\right)<0$ for all k of the unconstrained domain. Also note that

$\overline{k}/\underline{k} \geq 1$, such that the series $\left(\overline{k}/\underline{k}\right)_t$ is strictly decreasing and bounded; hence, there exists a limit. Moreover, the only possible limit is $\overline{k} = \underline{k}$, since, if the limit is equal to $r > 1$, for $\left(\overline{k}/\underline{k}\right)_t = r$, we then have that $\left(\overline{k}/\underline{k}\right)_{t+n} < r$, a contradiction. Finally, note that under full equality the growth rate and the enforcement level do not depend anymore on the level of capital holdings.

8.6 Biases

There are two potentially relevant biases. The first bias comes from the obvious endogeneity of the inequality level with respect to transfers. In order to solve for the bias, we have tried to follow Easterly (2001), which develops a set of instruments based on the historical findings of Engerman and Sokoloff (1997, 2000) that commodity production is associated with higher inequality. We have used therefore as instruments for inequality dummy variables for oil and non oil commodity exports, as well as for tropical location, but we found that no variable (including per-capita GDP) is consistently significant across all regression specifications. Given the low variability of the instruments, and the fact that there are only 14 to 23 observations for autocratic countries, this is not an unexpected result neither. However, note that, in the interval where the ratio of transfers to GDP decreases, transfers tend to bias the estimate downwards. Hence, whenever the estimate is significant, we can expect the real decrease in transfers to be even higher.

There is also a clear sample selection bias due to the fact that many under-developed and unequal countries, especially if autocratic, do not publish data neither on inequality nor on transfers. Nevertheless, to the extent that those are often high repression/low transfers countries, we can expect here as well the real decrease in transfers to be higher.

8.7 Data Description

Variable	*Description*
AUTOC I	Index of Autocracy I. Source: Przeworski et al. (2000).
AUTOC II	Index of Autocracy II. Source: Polity IV (2000).
EDUC	Public Spendings in Education as a Percentage of GDP. Source: World Development Indicators 2002 (henceforth: WDI 2002).
EFRAC	Measures the Probability that Two Randomly Selected Individuals in a Country Belong to Different Ethnolinguistic Groups. Source: Atlas Narodov Mira (1964) and Easterly and Sewadeh (2002).
GDP	GDP in thousands of 1995 US $. Source: WDI 2002.
GINI	Gini Coefficients (in Percentage Terms) Classified as *Accept*. Source: Deininger and Squire (1996).
GOV	Government Expenditures as a Percentage of GDP. Source: WDI 2002.
LAC	Latin America and Caribbean Dummy.
MIL	Military Expenditures as a Percentage of GDP. Source: Barro and Lee (1994) and WDI 2002.
POL	Index of Political Instability. Source: Barro and Lee (1994).
POP15	Percentage of Population Below Age 15. Source: WDI 2002.
SEASIA	South and East Asia Dummy.
SSA	Sub-Saharan Africa Dummy.

Variable	Average	St. Dev.	Min	Max
AUTOC I	0.29	0.45	0.00	1.00
AUTOC II	4.03	3.55	0.00	10.00
EDUC	4.16	2.54	0.27	37.06
EFRAC	41.46	29.80	0.00	93.00
GDP	5.49	8.38	0.09	49.39
GINI	39.11	9.39	20.97	62.30
GOV	15.94	7.02	2.34	58.31
LAC	0.18	0.39	0.00	1.00
MIL	1.82	3.92	0.00	51.16
POL	0.00	0.74	-0.41	4.56
POP15	36.67	9.45	14.28	51.16
SEASIA	0.19	0.39	0.00	1.00
SSA	0.24	0.43	0.00	1.00

Table 1 Summary Statistics.

	AUTOC I	AUTOC II	EDUC	EFRAC	GDP	GINI	GOV	LAC	MIL	POL	SEASIA	SSA
AUTOC II	0.60											
EDUC	-0.07	-0.09										
EFRAC	0.25	0.26	-0.05									
GDP	-0.27	-0.40	0.12	-0.37								
GINI	0.04	0.04	-0.13	0.05	-0.39							
GOV	-0.12	0.02	0.41	-0.15	0.17	-0.24						
LAC	-0.09	-0.16	-0.05	-0.26	-0.16	0.57	-0.17					
MIL	-0.15	0.15	0.07	-0.02	0.00	-0.11	0.34	-0.11				
POL	0.14	0.16	-0.01	0.13	-0.22	0.05	-0.13	0.13	0.06			
POP15	0.35	0.46	-0.14	0.41	-0.67	0.59	-0.15	0.13	-0.02	0.25		
SEASIA	-0.06	-0.02	-0.18	0.08	0.00	-0.10	-0.09	-0.24	0.01	-0.04	0.07	
SSA	0.31	0.27	0.02	0.57	-0.34	0.26	-0.01	-0.27	-0.07	0.07	0.47	-0.29

Table 2 Correlation Matrix.

	(1)				(2)				(3)			
Dep. Var.: Gov. Exp.	*Full*	*Dem.*	*Aut. I*	*Aut. II*	*Full*	*Dem.*	*Aut. I*	*Aut. II*	*Full*	*Dem.*	*Aut. I*	*Aut. II*
GINI	-0.132	-0.907 **	2.553 **	1.495 *	0.356 *	-0.388	1.942 **	1.316 **	-0.019	-0.641	2.101 **	1.986 **
	(-0.57)	*(-3.23)*	*(3.91)*	*(1.88)*	*(1.67)*	*(-1.52)*	*(3.26)*	*(2.14)*	*(-0.07)*	*(-1.55)*	*(2.92)*	*(2.08)*
$GINI^2$	0.001	0.010 **	-0.027 **	-0.016 *	-0.004	0.004	-0.020 **	-0.014 **	0.000	0.008	-0.024 **	-0.022 **
	(0.45)	*(2.91)*	*(-3.81)*	*(-1.80)*	*(-1.60)*	*(1.14)*	*(-2.96)*	*(-2.09)*	*(-0.11)*	*(1.46)*	*(-2.86)*	*(-2.01)*
GDP	0.302 **	0.288 **	-0.133	-0.007	0.237 **	0.241 **	-0.101	0.010	0.308	0.620 **	-0.183	-1.297 **
	(7.68)	*(6.62)*	*(-0.91)*	*(-0.04)*	*(6.86)*	*(6.36)*	*(-0.69)*	*(0.11)*	*(1.63)*	*(3.33)*	*(-0.26)*	*(-2.80)*
GDP^2									0.003	-0.007	-0.020	0.070 **
									(0.29)	*(-0.85)*	*(-0.35)*	*(3.78)*
LAC					-4.391 **	-2.434 **	-6.673 **	-5.088 **				
					(-4.71)	*(-2.44)*	*(-3.21)*	*(-3.11)*				
SEASIA					-5.888 **	-5.434 **	-6.352 **	-8.866 **				
					(-8.85)	*(-7.37)*	*(-4.68)*	*(-7.07)*				
SSA					-0.140	0.404	0.402	-0.693				
					(-0.12)	*(0.33)*	*(0.17)*	*(-0.35)*				
POL									-0.073	0.811	-1.495 *	-1.801
									(-0.10)	*(0.60)*	*(-1.86)*	*(-1.23)*
EFRAC									0.004	0.012	-0.026	-0.029
									(0.24)	*(0.77)*	*(-0.93)*	*(-0.88)*
CONSTANT	15.60 **	32.15 **	-43.10 **	-19.93	8.19 *	24.27 **	-27.53 **	-11.85	12.98 **	22.90 **	-30.49 **	-27.10
	(3.34)	*(5.65)*	*(-3.07)*	*(-1.15)*	*(1.93)*	*(4.86)*	*(-2.07)*	*(-0.85)*	*(2.13)*	*(2.92)*	*(-2.15)*	*(-1.35)*
nobs	298	216	73	78	298	216	73	78	152	102	50	42
MAX GINI	***52***	***46***	***46***	***48***	***44***	***55***	***49***	***47***	***-26***	***42***	***44***	***45***

Table 3 Basic regressions for government expenditure. T-statistics are in parenthesis.
*: significant at the 10% level. **: significant at the 5% level.

Dep. Var.: Gov. Exp.	(1)				(2)				(3)			
	Full	*Dem.*	*Aut. I*	*Aut. II*	*Full*	*Dem.*	*Aut. I*	*Aut. II*	*Full*	*Dem.*	*Aut. I*	*Aut. II*
GINI	0.059	0.104	1.159**	-0.072	0.252*	0.003	1.163**	0.083	-0.095	0.308	1.856**	1.626**
	(0.40)	*(0.57)*	*(3.22)*	*(-0.26)*	*(1.65)*	*(0.02)*	*(2.92)*	*(0.20)*	*(-0.61)*	*(1.35)*	*(5.63)*	*(3.51)*
$GINI^2$	-0.001	-0.002	-0.013**	0.004	-0.003*	-0.001	-0.014**	0.001	0.000	-0.004	-0.022**	-0.019**
	(-0.79)	*(-1.10)*	*(-3.24)*	*(1.08)*	*(-1.80)*	*(-0.59)*	*(-2.86)*	*(0.20)*	*(0.11)*	*(-1.52)*	*(-5.75)*	*(-3.63)*
GDP	0.371**	0.376**	-0.056	0.200**	0.204**	0.237**	0.070	0.011	0.209	0.090	-0.387*	-0.985**
	(20.92)	*(11.26)*	*(-0.32)*	*(2.18)*	*(8.23)*	*(6.11)*	*(0.53)*	*(0.18)*	*(0.84)*	*(0.51)*	*(-1.64)*	*(-4.04)*
GDP^2									0.000	0.000	0.002	0.055**
									(0.03)	*(-0.03)*	*(0.13)*	*(4.95)*
LAC					-3.990**	-3.102**	-5.170**	-9.015**				
					(-8.05)	*(-3.23)*	*(-2.49)*	*(-3.97)*				
SEASIA					-5.752**	-4.948**	-8.071**	-9.238**				
					(-17.13)	*(-6.06)*	*(-6.47)*	*(-7.57)*				
SSA					0.855*	0.818	9.078	-5.256				
					(1.67)	*(0.38)*	*(1.32)*	*(-1.42)*				
POL									-0.115	0.882	-0.526	-2.098**
									(-0.70)	*(1.46)*	*(-0.75)*	*(-2.98)*
EFRAC									-1.052	0.050	-0.052**	-0.046**
									(-0.69)	*(1.12)*	*(-3.29)*	*(-2.04)*
CONSTANT	11.15**	10.61**	-11.49	10.48*	10.99**	16.26**	-5.88	13.80	-178.51*	0.36	-23.05**	-18.72*
	(3.64)	*(2.83)*	*(-1.47)*	*(1.69)*	*(3.57)*	*(4.06)*	*(-0.69)*	*(1.62)*	*(-1.75)*	*(0.07)*	*(-3.09)*	*(-1.79)*
nobs	262	174	52	60	262	174	52	60	134	87	35	28
MAX GINI	***21***	***21***	***44***	***10***	***37***	***1***	***43***	***-44***	***284***	***40***	***43***	***43***

Table 4 Regressions for government expenditure with AR(1) errors. T-statistics are in parenthesis.
*: significant at the 10% level. **: significant at the 5% level.

	(1)				(2)				(3)			
Dep. Var.: Education	*Full*	*Dem.*	*Aut. I*	*Aut. II*	*Full*	*Dem.*	*Aut. I*	*Aut. II*	*Full*	*Dem.*	*Aut. I*	*Aut. II*
GINI	-0.063	-0.124	0.929 **	1.023 **	0.069	0.011	0.716 **	0.619 **	0.232	0.843	0.729 **	0.716 **
	(-0.68)	*(-0.94)*	*(4.51)*	*(3.47)*	*(0.67)*	*(0.08)*	*(3.47)*	*(2.14)*	*(0.92)*	*(1.06)*	*(4.47)*	*(2.69)*
$GINI^2$	0.001	0.001	-0.010 **	-0.010 **	-0.001	0.000	-0.007 **	-0.006 *	-0.003	-0.011	-0.008 **	-0.008 **
	(0.69)	*(0.80)*	*(-4.24)*	*(-3.11)*	*(-0.57)*	*(-0.25)*	*(-3.00)*	*(-1.82)*	*(-0.95)*	*(-1.10)*	*(-4.24)*	*(-2.44)*
GDP	0.094 **	0.089 **	-0.066	-0.092 **	0.079 **	0.068 **	0.017	-0.023	0.317 **	0.410 **	-0.003	-0.096
	(6.23)	*(4.63)*	*(-1.43)*	*(-2.82)*	*(4.97)*	*(3.75)*	*(0.22)*	*(-0.46)*	*(3.20)*	*(3.05)*	*(-0.02)*	*(-0.42)*
GDP^2									-0.002	-0.006 *	-0.001	-0.007
									(-0.82)	*(-1.72)*	*(-0.03)*	*(-0.43)*
POP15					0.001	-0.027	0.062	0.036	0.139 **	0.150 *	0.082 **	0.039
					(0.07)	*(-1.08)*	*(1.47)*	*(0.81)*	*(2.56)*	*(1.84)*	*(1.98)*	*(0.67)*
LAC					-0.745 *	0.008	-1.360 **	-0.722				
					(-1.85)	*(0.02)*	*(-2.00)*	*(-1.19)*				
SEASIA					-1.603 **	-1.325 **	-1.340 **	-2.057 **				
					(-6.25)	*(-4.13)*	*(-2.74)*	*(-4.06)*				
SSA					-0.087	0.911	-0.922	-1.216 *				
					(-0.10)	*(0.76)*	*(-1.23)*	*(-1.78)*				
POL									1.033	3.122	-0.707 **	-1.405 **
									(0.85)	*(1.24)*	*(-2.30)*	*(-2.65)*
MIL									5.261	-14.880	10.913 **	5.740
									(1.12)	*(-1.37)*	*(2.59)*	*(1.48)*
EFRAC									0.009	0.011	-0.005	-0.014
									(1.06)	*(1.30)*	*(-0.72)*	*(-1.57)*
CONSTANT	4.73 **	6.32 **	-17.55 **	-20.67 **	2.79	5.19 *	-14.94 **	-11.95 **	-7.04	-17.03	-16.51 **	-13.85 **
	(2.83)	*(2.61)*	*(-3.93)*	*(-3.20)*	*(1.58)*	*(1.90)*	*(-3.31)*	*(-1.97)*	*(-1.13)*	*(-1.04)*	*(-4.65)*	*(-2.27)*
nobs	282	205	66	68	282	205	66	68	139	93	46	34
MAX GINI	***39***	***46***	***48***	***51***	***45***	***12***	***50***	***53***	***39***	***37***	***47***	***47***

Table 5 Basic regressions for public spending in education. T-statistics are in parenthesis.
*: significant at the 10% level. **: significant at the 5% level.

	(1)				(2)				(3)			
Dep. Var.: Education	*Full*	*Dem.*	*Aut. I*	*Aut. II*	*Full*	*Dem.*	*Aut. I*	*Aut. II*	*Full*	*Dem.*	*Aut. I*	*Aut. II*
GINI	-0.011	0.000	1.311 **	1.183 **	0.044	-0.037	0.288 **	0.153	-0.095	-0.018	0.489 *	0.159
	(-0.38)	*(0.00)*	*(6.59)*	*(4.92)*	*(0.71)*	*(-0.38)*	*(2.26)*	*(0.63)*	*(-0.76)*	*(-0.12)*	*(1.95)*	*(0.70)*
$GINI^2$	0.000	0.000	-0.014 **	-0.011 **	-0.001	0.000	-0.003 **	0.000	0.001	0.000	-0.005 *	-0.001
	(0.11)	*(-0.29)*	*(-6.34)*	*(-4.05)*	*(-0.79)*	*(0.07)*	*(-2.20)*	*(-0.01)*	*(0.63)*	*(-0.05)*	*(-1.76)*	*(-0.35)*
GDP	-0.036 **	0.120 **	-0.059 *	-0.112 **	0.066 **	0.078 **	0.107	0.014	0.206 **	0.317 **	-0.191	0.032
	(-2.31)	*(9.82)*	*(-1.69)*	*(-4.91)*	*(4.14)*	*(3.75)*	*(1.44)*	*(0.55)*	*(2.95)*	*(3.02)*	*(-1.28)*	*(0.13)*
GDP^2									0.000	-0.005 *	0.016 *	-0.007
									(-0.26)	*(-1.75)*	*(1.73)*	*(-0.56)*
POP15					0.000	0.000	0.001	0.000	0.001 **	0.000	0.000	0.001 *
					(-0.66)	*(-1.06)*	*(1.27)*	*(1.38)*	*(2.21)*	*(0.58)*	*(0.21)*	*(1.64)*
LAC					-0.979 **	-0.007	11.066	-1.420 **				
					(-2.71)	*(-0.02)*	*(0.41)*	*(-4.86)*				
SEASIA					-1.851 **	-1.057 **	-9.386	-2.246 **				
					(-7.28)	*(-2.97)*	*(-0.82)*	*(-11.83)*				
SSA					-1.039 *	-0.544	*(Dropped)*	-2.466 **				
					(-1.81)	*(-0.94)*		*(-2.77)*				
POL									0.092	1.377 **	0.247	-2.061 **
									(0.39)	*(5.58)*	*(0.72)*	*(-3.67)*
MIL									4.580	-25.640 **	4.289 **	5.103 **
									(1.26)	*(-2.18)*	*(2.54)*	*(2.15)*
EFRAC									-0.009 *	0.005	-0.021 **	-0.022 **
									(-1.76)	*(0.51)*	*(-2.80)*	*(-2.83)*
CONSTANT	-29.60 **	3.49 *	-26.27 **	-24.96 **	3.96 **	5.71 **	-19.35 *	-2.46	2.30	2.94	-7.98	-6.32
	(-9.63)	*(1.86)*	*(-5.97)*	*(-4.95)*	*(3.09)*	*(2.70)*	*(-1.69)*	*(-0.46)*	*(0.76)*	*(0.79)*	*(-1.61)*	*(-0.96)*
nobs	244	163	46	46	242	163	44	44	121	79	30	19
MAX GINI	***152***	***-1***	***48***	***53***	***37***	***234***	***43***	***2790***	***49***	***-96***	***50***	***90***

Table 6 Regressions with AR(1) errors for public spending in education. T-statistics are in parenthesis.
*: significant at the 10% level. **: significant at the 5% level.

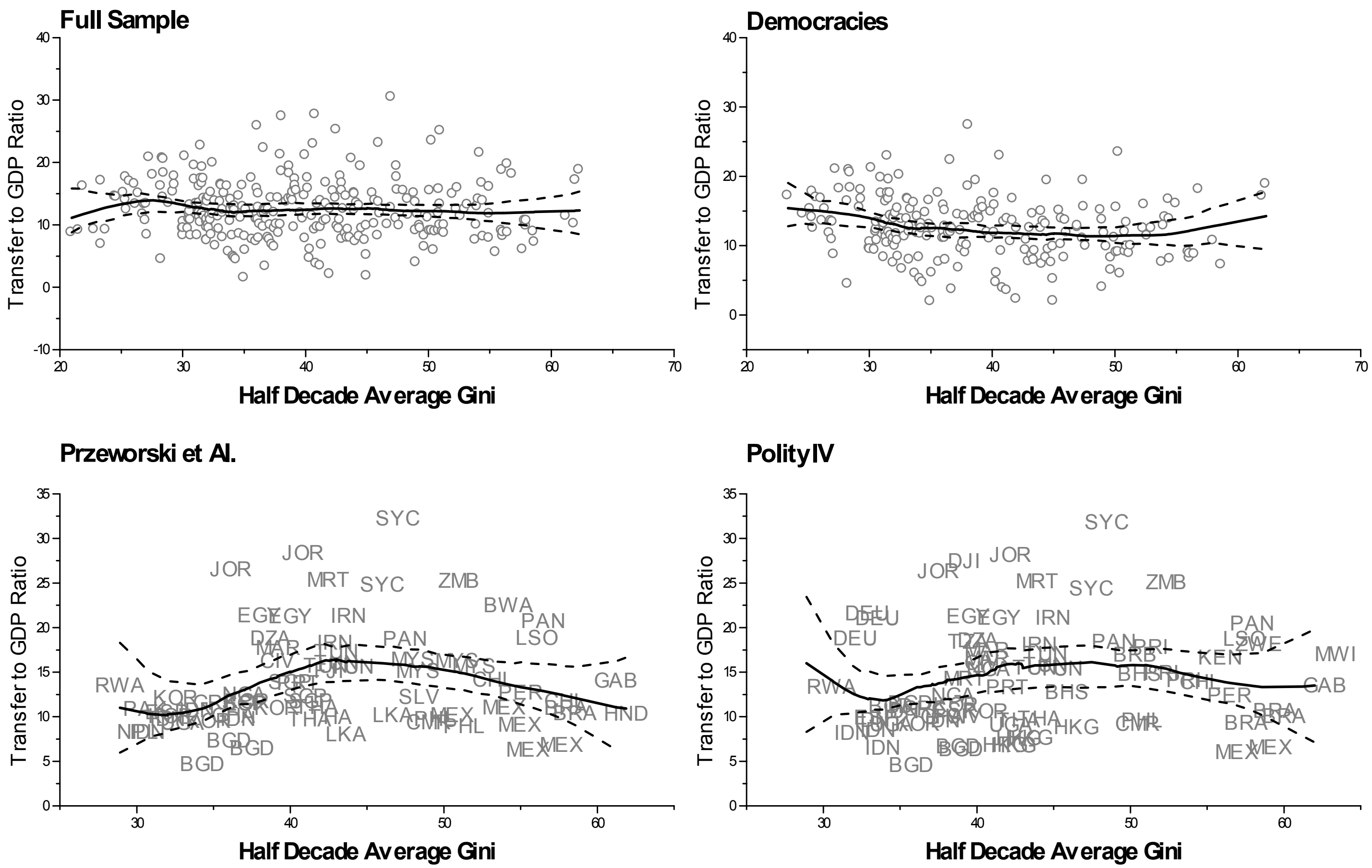

Figure 9 Nonparametric estimation for government expenditure. The dashed lines represent the 95% confidence interval.

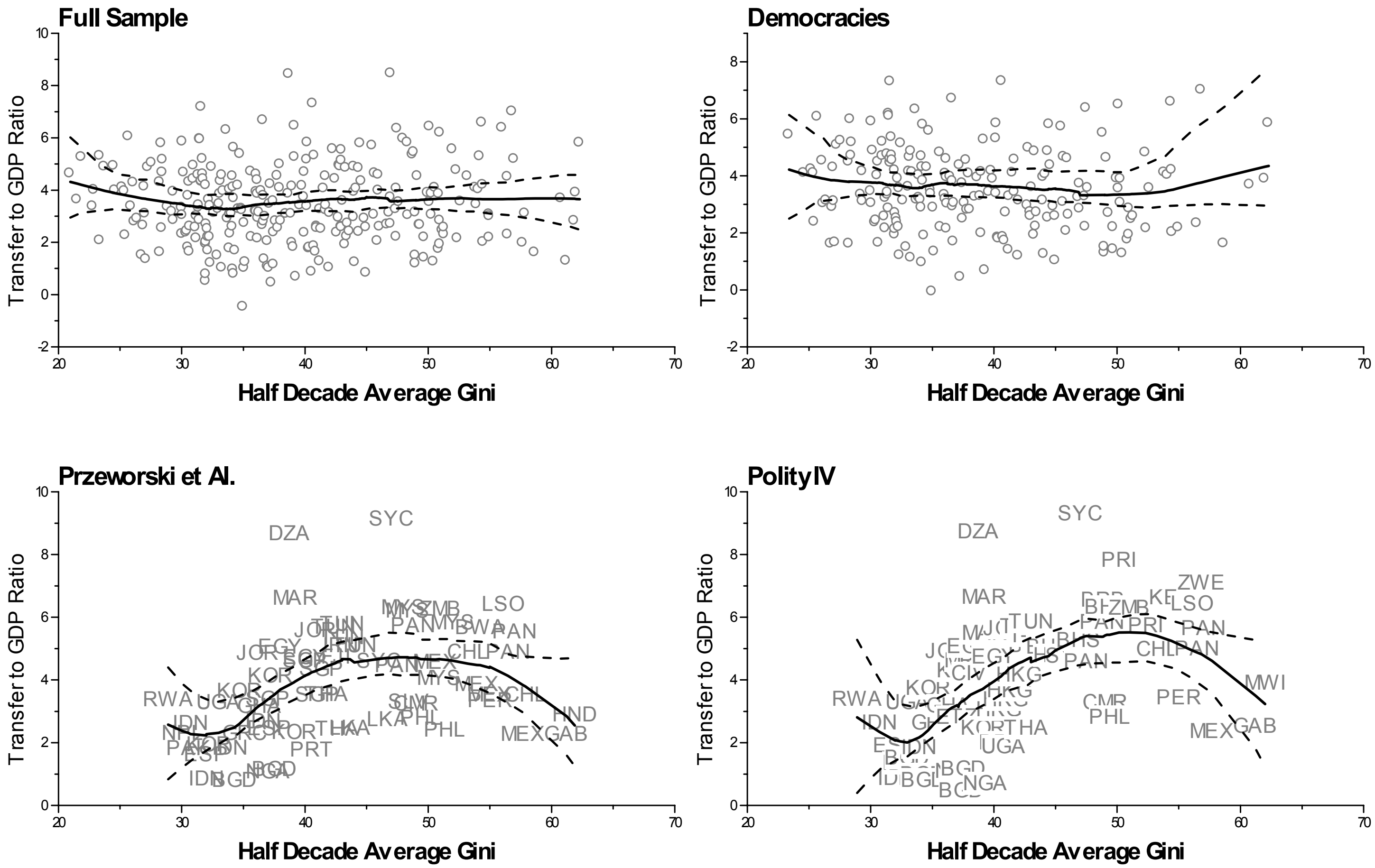

Figure 10 Nonparametric estimation for public expenditure in education. The dashed lines represent the 95% confidence interval.