Growth, Income Distribution and Democracy: What the Data Say

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1 Introduction.

This paper investigates the relationship between income distribution, democratic institutions, and growth. It does so by addressing three main issues. First, the properties and reliability of the income distribution data; second, the robustness of the reduced form relationships between income distribution and growth estimated so far; third, the specific channels through which income distribution affects growth.

The theoretical literature on income distribution and growth has expanded enormously in recent years [1]; on the empirical side, however, progress has been much slower. Probably the most important reason has been the perceived limitations of existing cross-section data on income distribution, both in terms of availability of observations and in terms of their quality. A discussion of the income distribution datasets currently used and of their comparative properties is therefore fundamental for an evaluation of the existing empirical evidence.

Practically all this evidence consists of reduced form estimates that add income distribution variables to the set of independent variables of otherwise standard growth regressions. In the vast majority of these estimates, equality has a positive impact on growth. The second important issue studied in this paper is precisely the robustness of this positive reduced form relationship between equality and growth.

Other properties of the reduced form have been more controversial. For instance, several theories postulate a different relationship between equality and growth in democracies and non-democracies. Different empirical studies have reached opposite conclusions on this point. To what extent are these contrasting results due to differences in the income distribution data used, and to what extent are they due to differences in the specification and in the samples? A conclusion of the paper is that specification issues, rather than data, are crucial in this respect.

The theoretical literature provides an array of very different explanations for the positive correlation between equality and growth. By its nature, a reduced form estimate

[1] Alesina and Perotti (1994) and Perotti (1994a) provide two short surveys of some recent developments in this field.

cannot shed light on the underlying mechanisms. Hence the importance of the third issue - evaluating the specific channel(s) of operation of income distribution by estimating the structural models behind the reduced form. The paper explores the four channels that have emerged in the literature: endogenous fiscal policy, socio-political instability, borrowing constraints, and endogenous fertility. The main conclusion in this regard is that there is strong empirical support for two types of explanations, linking income distribution to socio-political instability and to the education/fertility decision. A third channel, based on capital market imperfection, also seems to receive some support by the data, although it is probably the hardest to test with the existing data. By contrast, there appears to be less empirical support for explanations based on the effects of income distribution on fiscal policy and on capital market imperfections.

The plan of this paper is as follows. The next section briefly surveys the main recent theories on income distribution and growth. Section 3 presents and discusses the income distribution data used throughout this paper. Section 4 studies extensively the reduced form relationship between income distribution and growth. Sections 5, 6, and 7 study the approaches based on fiscal policy, socio-political instability, and imperfect capital markets/endogenous fertility, respectively. Section 8 concludes.

2 A very brief survey of the main approaches.

At the risk of some oversimplification, the recent literature on income distribution and growth can be divided into three main approaches: the "fiscal policy", "socio-political instability", and "imperfect capital market" approaches. A fourth approach, which deals with the relationship between income distribution on one side and human capital investment and fertility decisions on the other, has not been fully formalized, to the best of my knowledge. However, for the purposes of this paper one can speculate what this relationship might be by applying simple compositional arguments to a well established, representative agent literature. For lack of a better name, this approach can be called the "endogenous fertility" approach.

In the fiscal policy approach of Alesina and Rodrik (1994), Bertola (1993), Perotti (1993), Persson and Tabellini (1994), and many others, income distribution affects growth via its effects on government expenditure and taxation. For the sake of brevity, consider a highly stylized framework where fiscal policy is decided by majority voting, taxation is proportional to income, and tax revenues are redistributed lump-sum to all individuals. Thus, the tax rate and the level of the benefit are positively related through the government budget constraint.

This type of fiscal policy is redistributive because the taxes an individual pays are proportional to his income; the benefits of expenditure, however, accrue equally to all individuals. Consequently, the level of taxation and expenditure preferred by an individual are inversely related to his income. Since this is also true for the median voter - the decisive voter under some well-known conditions -, in equilibrium the median income on one side and the level of expenditure and taxation on the other are negatively related. This relationship between the income of the median voter and the level of expenditure and taxation, via the political process, constitutes the first logical component of the fiscal policy approach, or its "political mechanism".

In turn, redistributive government expenditure and taxation are negatively related to growth, primarily because of their disincentive effects on private savings and investment. The second logical component of the fiscal policy approach is this negative link between government expenditure and growth, which can be termed its "economic mechanism".

In summary, in a more equal society there is less demand for redistribution (the political mechanism), and therefore lower taxation and more investment and growth (the economic mechanism). Thus, the fiscal policy approach posits a positive reduced form relationship between equality and growth.

The fiscal policy approach can then be summarized in three simple results ("FP" stands for "fiscal policy"):

Result FP1 (the economic mechanism): Growth increases as distortionary taxation decreases;

Result FP2 (the political mechanism): Redistributive government expenditure and there-

fore distortionary taxation decrease as equality increases;
Result FP3 (the reduced form): Growth increases as equality increases.

Most of the existing literature can be interpreted as estimating FP3;[2] this paper goes beyond this by estimating FP1 and FP2, and similarly for the other approaches.

The fiscal policy approach also implies a fundamental distinction between democracies, where in the long run fiscal policy reflects the preferences of the majority and therefore the distribution of income, and non-democracies, where the link between income distribution and fiscal policy is, at most, indirect. In other words, the effect of the fiscal policy variable in the political mechanism and in the reduced form should be stronger in democracies. This is a testable implication of the model, which will be exploited in the next sections.

According to the socio-political instability approach of Alesina and Perotti (1995), Gupta (1990), Hibbs (1973), Venieris and Gupta (1983) and (1986), and others, a highly unequal, polarized distribution of resources creates strong incentives for organized individuals to pursue their interests outside the normal market activities or the usual channels of political representation. Thus, in more unequal societies individuals are more prone to engage in rent-seeking activities, or other manifestations of socio-political instability, like violent protests, assassinations, coups, etc.

In turn, socio-political instability discourages investment for at least two classes of reasons. First, it creates uncertainty regarding the political and legal environment. Second, it disrupts market activities and labor relations, with a direct adverse effect on productivity. Theoretical models that formalize these or related ideas include Benhabib and Rustichini (1991), Fay (1993), Tornell and Lane (1994) and Svensson (1994).

Like the fiscal policy approach, the socio-political instability approach can be summarized in three results ("SPI" stands for "socio-political instability"):
Result SP1: Investment and growth increase as socio-political instability decreases;
Result SP2: Socio-political instability decreases as equality increases;
Result SP3 (the reduced form): Growth increases as equality increases.

[2]The only exception I am aware of is Persson and Tabellini (1994), who however have only 11 and 10 degrees of freedom in their regressions for FP1 and FP2, respectively. The coefficients they estimate are never significant.

Thus, the socio-political instability approach too posits a positive reduced form relationship between equality and growth, although the underlying mechanisms are markedly different from the fiscal policy approach.

A sizable strand of recent research has emphasized the link between capital market imperfections, the distribution of income and wealth and a society's aggregate investment in human and other forms of capital. A very partial list of contributions includes Aghion and Bolton (1993), Galor and Zeira (1993), Banerjee and Newman (1991) and (1993). The basic idea that emerges from these models is simple: when individuals cannot borrow freely against future income, the initial distribution of resources can have a large impact on the economy's pattern of investment and therefore of growth. A fairly general, although not universal, conclusion of these models is that, if wealth is distributed more equally, more individuals are able to invest in human capital, and consequently growth is higher.[3]

This relationship would persist in the long-run under two main sets of circumstances. If there are fixed costs of investment in education, a dynasty that starts out poor and cannot invest in education, will keep doing so generation after generation. However, one could argue that the direct costs of education are negligible for primary and, in most countries, even secondary education. The largest component of the cost of education, particularly secondary education, is foregone income. In this case, if the marginal utility of consumption at very low levels of consumption is very high, poor individuals who cannot borrow will not invest in education. Since their children will start out in the same position, that dinasty will be caught in a poverty trap, with no investment in human capital (see De Gregorio (1994) for a representative agent model based on this mechanism).

The distribution of income and wealth also affect how pervasive borrowing constraints are in an economy. If utility is bounded from below, poor individuals might be unable to borrow because of the incentive problems borrowing creates (see Banerjee and Newman (1994)). In this case, the distribution of income and wealth will also determine how many

[3]This conclusion is subject to at least one important qualification: in very poor societies, it might be the case that only the rich can possibly invest in education. Therefore, investment in human capital would be maximized if wealth were concentrated in the hands of the rich. In this case, growth would be *positively* related to inequality: see Aghion and Bolton (1993) and Perotti (1993) for models based on this mechanism.

individuals are close to the lower bound and therefore are unable to borrow.

Although this approach deals primarily with the distribution of wealth, its empirical implications can be stated in terms of the distribution of income because of the large correlation between indicators of equality derived from the two distributions. Like the other two, this approach can then be summarized in three results ("ICM" stands for "imperfect capital markets"):

Result ICM1: Growth increases as investment in human capital increases;

Result ICM2: For any given degree of imperfection in the capital market, investment in human capital increases as equality increases;

Result ICM3 (the reduced form): Growth increases as equality increases.

In an optimizing model, investment in education and fertility would be strictly connected because they can be interpreted as two alternative uses of the parents' human capital: the former, in the quality of the immediate descendants, the latter, in their quantity. In spite of this close theoretical link, demographic factors, and in particular fertility, have been largely ignored in the literature on income distribution and growth. Galor and Zang (1993) is the only contribution that deals with the interaction of income distribution, imperfect capital markets, schooling and fertility simultaneously. In their model, given the distribution of income, a higher fertility means that less resources are available within each family to finance the education of each child; with fixed costs of education and borrowing constraints, fewer children will be able to attend school. Similarly, given the fertility rate, a more skewed distribution of income is associated with lower enrollment ratios because of the inability to borrow against future income. Fertility, however, is not endogenized in their model.

The joint decision about fertility and schooling has been studied extensively in the context of representative agent models of growth (see, for instance, Becker and Barro (1988) and Becker, Murphy and Tamura (1991)). By interpreting the representative agent of these models as a dynasty, and by varying the initial human capital of a dynasty, using a simple compositional argument one can speculate on the predictions of these models regarding the relationship between the distribution of human capital on one side and human capital investment and fertility on the other.

Fertility and schooling decisions are the result of the interplay of the direct cost of raising children and the opportunity cost of the parents' human capital. An increase in the human capital of the parents has two effects on fertility. The income effect implies a higher demand for children; on the other hand, the opportunity cost of raising children increases, and therefore the substitution effect implies a lower demand for children. At low levels of human capital, the direct cost is the main component of the total costs of raising children, inclusive of the opportunity costs. Therefore, an increase in the parents' human capital has little effect on the total costs of raising children and the income effect prevails. At high levels of human capital, the substitution effect of an increase in human capital prevails because the direct cost of raising children is a relatively small part of the total costs. Thus, at sufficiently high levels of human capital, an increase in human capital leads to less fertility and higher investment in human capital.

Now imagine a redistribution of human capital from individuals that have a high endowment to individuals with a low endowment of human capital, and suppose that the substitution effect of an increase in human capital prevails. The rate of return to investment in education for poor individuals would increase, and their demand for children would fall. This would likely increase aggregate enrollment ratios and decrease fertility if, at low levels of human capital, the demand for children is sufficiently elastic to human capital and the demand for human capital investment is sufficiently elastic to the rate of return. Thus, one could speculate that a reasonable extension of these models to a non-degenerate distribution of income would predict a negative relationship between equality and fertility, and a positive relationship between equality and investment in human capital. The higher investment in human capital would also lead to higher growth.

One can try to summarize these conclusions in the following results: ("EF" stands for "endogenous fertility"):

<u>Result EF1</u>: Growth increases as investment in human capital increases and fertility decreases;

<u>Result EF2</u>: Fertility decreases and investment in human capital increases as equality in-

creases;

Result EF3 (the reduced form): Growth increases as equality increases.

Notice that results FP3, SPI3, ICM3, and EF3 are identical: in other words, all four approaches predict the same positive relationship between equality and growth. The underlying mechanisms, however, are markedly different, which motivates the empirical investigation of this paper.

3 The income distribution data.

In testing the theories surveyed above, two preliminary problems arise. First, as it was mentioned above, in several cases the relevant distribution is that of wealth rather than income. Data on the distribution of wealth do not exist for a sufficient number of countries, and the distribution of income must be used as a proxy. Empirically, however, this is unlikely to be a serious problem because the shapes of the two distributions generally vary together in cross-sections, although the former tends to be more skewed than the latter.

The second problem is that in many of the theories surveyed above, the effect of income distribution on growth might depend on the whole shape of the distribution of income. In addition, it is well known that widely used compact measures of the distribution of income might not always provide an unambiguous ranking according to a specific criterion: for instance, this would be the case if the Gini coefficient were used and the underlying Lorenz curves intersect. Thus, one has to take a stance on what is the appropriate measure of equality to be used in the empirical analysis.

Once again these problems might be more important in theory than in practice. Empirically, different measures, like income quintiles, the Gini coefficient or the ratio of the top quintile to the bottom quintile, are highly correlated. The main measure of equality that will be used throughout this paper is the combined share of the third and fourth quintile. This measure has several advantages. It captures the notion of "middle class", whose size is often associated with the concept of equality. It is also highly correlated with the share of the third quintile, which is the natural measure to use when testing the fiscal policy approach. Relative to this last measure, the share of the middle class is less sensitive to measurement errors.

I construct the share of the middle class from an income distribution dataset that includes quintile shares in income for 67 countries, listed in Table 3.[4] Most observations are obtained from two compilations: Jain (1975) and Lecaillon et al. (1984). The observations are taken as close as possible to 1960, the initial year of the period on which average GDP growth is measured, to ensure that income distribution can reasonably be regarded as exogenous in these regressions.

More so than for most other variables that appear regularly in growth regressions, the quality of income distribution data has often been questioned. Income quintile shares typically are computed from surveys, which immediately suggests at least two types of potential problems. First, and for obvious reasons, in any given survey the raw figures may be subject to very large measurement errors. Second, it it hard to compare quintile shares across countries, as the surveys they are derived from can vary remarkably in at least three respects: the definition of the recipient unit, the income concept, and the coverage.

The existing data refer to four different recipient units: by households, by income recipients, by economically active persons, and by individuals. Although definitions themselves may change from survey to survey, an economically active person is usually defined as an individual of working age while an income recipient is any individual who receives any type of income. Often, data by economically active persons imply a greater inequality than data organized by households, because the fraction of economically active persons in a household tends to decrease as the household income increases. In addition, data by economically active persons do not include transfers, that are instead included (at least, in principle) in data organized by households. On the other hand, data organized by economically active persons might understate the degree of inequality because they typically do not include the income from dividend, interest and rents, which accrue disproportionately to the top

[4]The dataset I have assembled includes a total of 74 observation on quintile shares. However, the overlap with the proxy for human capital used in this paper is only 67 countries. In previous versions of this paper, that used the primary school enrollment ratio as proxy for human capital, all 74 countries could be used.

quintile. Similar considerations apply to data by income recipients[5]

Most data are based on household surveys. Whenever data by households and by another criterium, e.g., by individuals, are available for the same country and the same year, one can exploit the information contained in these two surveys to make data organized by individuals more comparable to data organized by households. Specifically, one can compute the average sizes of the middle class in the two distributions, call them avg(MID_{HSLD}) and avg(MID_{IND}) respectively, where the average is taken over all the years and countries for which data on MID organized both by households and individuals are available. One can then construct the average factor by which the middle class in the distribution by households exceeds of falls short of the middle class in the distribution by individuals, i.e. $x = \text{avg}(MID_{HSLD})/\text{avg}(MID_{IND})$. Finally, one can apply this factor to the value of the middle class MID_{IND} for those countries that have only the distribution by individuals. For country i, this gives an estimated size of the middle class by household est($MID_{HSLD,i}$) $= x \cdot MID_{IND,i}$. All the non-household-based data that I use in this paper are ajusted following this criterion. However, using not adjusted data does not alter the results in any way. In fact, the highest value of the factor x was 8.4% in the case of the distribution by income recipient, which applies only to a handful of countries.

Finally, surveys can have a nationwide coverage, or can be limited to urban or rural areas, or even to specific classes of agents, like workers or taxpayers. All the observations in the dataset, except 6, come from nationwide surveys. Again, one can apply the method described above to obtain a conversion factor, that I used to multiply the original, non-nationwide data into estimated nationwide values[6]

[5]Income distribution data may also differ because of the type of survey they are derived from, whether it is an income, expenditure or consumption survey. With the exception of Van Ginneken and Park (1984), the existing compilations of data do not provide this type of information. An additional problem is that the definitions of income used to generate the income distribution data generally include some (but not all) transfer payments and are net of some taxes, while a proper test of the theories surveyed here would require pre-tax and pre-transfer data. Moreover, which type of transfer payments and taxes are included may vary from country to country and from survey to survey (see Van Ginneken and Park (1984) for an interesting discussion of this issue). Because transfers make up a higher proportion of the disposable income of poorer households, the inclusion of transfers tends to underestimate the degree of inequality in the distribution of income.

[6]More details on these problems and the methodology used to make the different data more comparable can be found in Perotti (1994b).

Data on MID (the share of the middle class) resulting from these adjustments are illustrated in Table 3. The table vividly shows the wide cross-country variation in the distribution of income. The difference between the highest share (41.9% in Denmark) and the lowest share (22.5% in Kenya) is equal to about 4 times the standard deviation. Note also that the distribution of the data accords well with widespread notions. For instance, the share of the middle class is low in most Latin American countries, and high in most OECD countries. Also, the three South-East Asian "tigers" for which income distribution data are available, South Korea, Taiwan and Korea, which are frequently cited as examples of egalitarian societies, have higher shares of the middle class than most of the countries with comparable levels of income per capita in 1960.

With few exceptions noted in the text, the bulk of the remaining data are quite standard in the recent empirical growth literature. The main source is Barro and Lee (1994). Other sources include Easterly and Rebelo (1993) and Jodice and Taylor (1988). A complete description of all the data and their sources can be found in the data appendix.

4 Reduced form estimates.

The reduced form estimation strategy involves five steps. First, in order to isolate the effects of income distribution as clearly as possible, I start from a simple and widely accepted specification of the reduced form, and I add an income distribution variable to the set of regressors. Second, I study the sensitivity of these results to the inclusion of certain variables that are highly correlated with income distribution and whose effects are likely to be captured by income distribution. Third, I address the issues of measurement errors, heteroskedasticity, robustness to outliers, etc. Fourth, I study whether the relation between income distribution and democracies is different in democracies and non-democracies, as postulated by the fiscal policy approach, and whether the democracy effect can be distinguished from an income effect. Finally, I study how the results change when different income distribution datasets and different definitions of democracy are used.

4.1 Basic reduced form regressions.

Column (1) in Table 4 presents the most basic specification of the income-distribution-augmented growth equation. The dependent variable is the average rate of growth of income per capita between 1960 and 1985. The independent variables are MID and four among the most standard regressors in the growth literature: per capita GDP in 1960 (GDP), the average years of secondary schooling in the male and female population (MSE and FSE, respectively) in 1960, and the PPP value of the investment deflator relative to the U.S. in 1960 ($PPPI$). As usual, the inclusion of GDP is motivated by the notion of conditional convergence. The two schooling variables proxy for the stock of human capital at the beginning of the estimation period. Previous empirical studies of income distribution and growth (like Alesina and Perotti (1995), Alesina and Rodrik (1994), Persson and Tabellini (1994), Clark (1994), Perotti (1994b)) used the primary and, in some cases, the secondary school enrollment ratios as proxies for the stock of human capital. The problems in interpreting these variables, which have the dimension of a flow, as proxies for a stock, are well known (see for example the discussion in Barro (1991)). For the purposes of this paper, it is particularly important to distinguish between stock and flow of human capital, because the latter is the endogenous variable in one of the theories tested here. Various measures of the stock of human capital have recently been made available in the Barro and Lee dataset. The two measures used here have also been used, for instance, in Barro and Sala-I-Martin (1995). Relative to the primary enrollment ratio, the use of average years of schooling implies a loss of 7 observations. However, this does not cause major differences in the estimates of the effects of income distribution. Finally, $PPPI$, the PPP value of the investment deflator, proxies for market distortions.

The choice of the regressors in the basic specification is dictated by three considerations. First, comparability with the existing literature: in order to evaluate the impact of income distribution, it is important to make as little changes as possible relative to standard growth regressions, besides the introduction of income distribution on the RHS. A widely used specification is that of Barro and Sala-I-Martin (1995), which is therefore the basis for the list of regressors on the RHS of my regression. Second, a need for parsimony:

the maximum number of observations is limited by the availability of income distribution data, which in some regressions can include less than 30 countries. In many cases, including other variables would drastically reduce the number of degrees of freedom, as the overlap between the income distribution sample and other samples is often limited. Third, theoretical considerations: some control variables that are typically used in standard growth equations, like government expenditure and proxies for political and institutional instability, are endogenous variables according to the models tested here, and will be dealt with in the structural estimation of the following sections.

Column (1) shows that in the whole sample growth is positively associated with income equality, as predicted by all the approaches surveyed in section 2. The effect of income distribution on growth implied by the point estimate is quite large: an increase in MID by one standard deviation is associated with an increase in the rate of growth of GDP per capita by about .6%, or 1/3 of its standard deviation. The size of this effect is very close to that found by other researchers, like Alesina and Rodrik (1994), Clark (1994) and Persson and Tabellini (1994), who also include a similar set of regressors.[7]

Note also the opposite signs on the coefficients of MSE and FSE. The explanation offered by Barro and Sala-I-Martin (1995), who obtain the same result on a larger sample, is that a lower initial female attainment, for a given male attainment, indicates more backwardness and therefore faster subsequent growth as the economy converges towards its steady state. I discuss the role of this variable at length in section 7.

4.2 Sensitivity.

Because of the parsimonious specification of the reduced form, it might well be that the income distribution variable in regression (1) is picking up the effects of other variables correlated with both income distribution and growth. The next columns in Table 4 concentrate on four types of omitted variables that are *a priori* likely to be relevant in this context: regional dummy variables, urbanization and other indicators of development, demographic

[7]The main difference is that the proxy for human capital in all these contributions is the primary enrollment ratio rather than the stock variable used here.

variables, and other indicators of human capital not considered so far. These variables clearly do not exhaust the list of omitted variables that are potentially important. Many of these candidates, however, are endogenous according to the theories surveyed before, and will receive a more extensive treatment in the next sections.

(*i*) In column (2), I add dummy variables for South-East Asia, Latin America and Sub-Saharan Africa. The coefficients of these dummy variables have the expected signs: Latin American and Sub-Saharan countries have grown slower and South-East Asian countries faster than average over this period. Also intuitively, the coefficients of MID falls, by about 30%: in fact, South-East Asian have not only high rates of growth, but also high levels of equality; symmetrically, Latin American and African countries often have high levels of inequality, in addition to low rates of growth. These results suggest that inter-continental variation in income distribution accounts for a substantial part of the variation behind the results in regression (1).

(*ii*) According to Kuznets (1955), the level of urbanization influences income distribution because urban areas are characterized by more inequality relative to rural areas, but also by a higher per-capita income. In general, the combination of these two effects implies that urbanization is associated with an increase in inequality in the initial stages of development, and with a fall in inequality as a country gets richer. This is borne out by the data: the correlation between MID and URB is negative for countries with an income per capita below $1,500 in 1960, but positive for richer countries[8].

In turn, urbanization could be correlated with growth, for several reasons. A positive correlation could arise because urbanization is a precondition for growth, for instance because a modern manufacturing sector can only arise in a urbanized environment. Alternatively, a negative correlation could arise because only in urbanized economies is it possible to implement an efficient tax collection system; the resulting higher tax rate leads to lower rates of growth, *ceteris paribus*, in more urbanized economies. The coefficient of

[8]The cut-off point of $1,500 corresponds very closely to the median per capita income of $1,472 (Jamaica). Thus, when this cut-off point is imposed the group of poor countries includes all the countries up to the median, plus Greece that has a 1960 per capita income only 2 dollars higher than Jamaica. The next country after Greece, Costarica, has a 1960 per capita income almost $200 higher. In any case, the results do not depend in any way on the precise value of the cut-off point.

URB in column (3), however, is completely insignificant, and does not affect the coefficient of *MID*. Other variables that capture certain aspects of development, like the share of manufacturing in GDP, also do not have any appreciable effect on the income distribution coefficient.

(*iii*) The share of the population over 65 years of age, *POP*65, is an important demographic variable, for reasons that are particularly relevant in the context of the fiscal policy approach. Similarly to the case of urbanization, the age structure of the population might be correlated with income distribution because of the composition of two effects: inequality is lower among retirees, but so is their average income. In practice, *POP*65 and *MID* are highly positively correlated: their simple correlation is .71. In turn, the demand for social security is higher the older the population; hence, according to this argument, omitting the age structure of the population would bias the coefficient of the income distribution variable *downward*, as more expenditure on social security is associated with more distortions and lower growth. However, column (4) shows that when *POP*65 is included, the coefficient of the income distribution variable *falls* substantially and becomes insignificant in both samples.

There are two possible explanations for this result, not mutually exclusive. The first is that, as shown in the next section, social security expenditure is *positively*, rather than negatively, associated with growth, which might account for the fact that *POP*65 too is *positively* correlated with growth. Second, *POP*65 is probably proxying for the fertility rate: although the first variable has the dimension of a stock and the second of a flow, in countries with persistently high fertility rates one would expect the share of population over 65 to be low. In fact, the simple correlation between *FERT* and *POP*65 is among the highest of all pairs of variables, -.89 (see Table 3). *POP*65 would then capture the rate of fertility, which empirically is negatively associated with growth and equality. Under this interpretation, a fall in the estimated coefficient of *MID* is not surprising when *POP*65 is included. But obviously, this need not affect the interpretation of *MID* in the reduced form, simply because *POP*65 would be capturing the effects of an endogenous variable. Regression (4) would simply imply that income distribution affects growth through its effects on fertility, a channel for which there is ample empirical support (see section 7).

(*iv*) Income distribution is likely to be correlated with dimensions of human capital and health that are not captured by the human capital variables used so far. An important candidate in this respect is life expectancy. As discussed in Barro and Sala-I-Martin (1995), for a given level of human capital, a higher life expectancy is likely to imply better work habits and higher skills, and therefore higher productivity and growth. In turn, a more equal distribution of income leads to large gains in life expectancy, as improvements in life expectancy are likely to be concave in individual income. In fact, controlling for life expectancy, as in column (5), reduces the estimates of the coefficient of income distribution, although it remains statistically significant.

4.3 Heteroskedasticity, measurement errors, and robust estimation.

For all the reasons discussed in section 3, income distribution data are likely to be subject to sizable measurement errors. However, a random measurement error would cause a *downward* bias in the coefficients of the income distribution variables in all the regressions presented so far. Moreover, it is probably not advisable to instrument the income distribution variable in order to perform Hausman-type tests of measurement error, since it is very hard to come up with plausible instruments for income distribution. Many of the instruments that have been used in the literature (like secondary school enrollment ratios and fertility rates, as in Alesina and Rodrik (1994) and Clark (1994)) appear as endogenous variables in some approach. For this reason, I will proceed to check the robustness of the results to measurement errors and to outliers using other methods.

The simplest way to check for the robustness of the results consists in dropping one observation at a time. Columns (1) and (2) of Table 5 display the maximum and minimum estimated coefficients, respectively, of MID in the basic regression of column (1) in Table 4, in all the possible 67 regressions with 66 countries, and the corresponding t-statistics. The range of estimates of the coefficient of MID is quite limited, between .093 and .136, with a t-statistic always above 2.26. The minimum value is obtained when Venezuela, a low-growth, high inequality country, is excluded. The maximum value is obtained when Togo, with very low inequality and relatively low growth, is excluded.

Columns (3), (4), (5) and (6) investigate the role of possible outliers, along several dimensions. First, one might suspect that the results are due to a few, very unequal countries with particularly low rates of growth. Column (3) excludes the 8 countries with a value of MID more than 1.5 standard deviations below the average. The point estimates of MID change only minimally. Next, it is important to verify whether the results are driven by a few countries with very high rates of growth and low inequality (the obvious candidates in this regard are many East Asian countries, and in particular the three "Asian Tigers" for which income distribution data are available) or by a few countries with very high inequality and low growth rates (several Latin American countries). Thus, columns (4) and (5) exclude all countries with growth rates more than 1.5 standard deviations above and below the average, respectively. In both cases, this causes a loss of 5 observations, but the point estimates of the coefficient of MID are largely unaffected. One could also argue that the very poor countries of the sample might somehow blur the picture, because on average their share of the middle class is comparable to that of rich countries rather than to that of middle-income countries (see Table 3).[9] In fact, once the 9 countries with per capita GDP in 1960 of less than $500 are excluded in column (6), the point estimate and the t-statistic of the coefficient of MID increase substantially.

A more complete way to test the robustness of the estimates consists in reestimating the basic regressions using a robust estimator. Typically, robust estimators are constructed by downweighing, according to some criterion, those observations with large residuals. However, certain observations could be outliers in the regressors' space without displaying a large residual. The Krasker-Welsch estimator, described in Kuh and Welsch (1980), Krasker and Welsch (1982) and Krasker, Kuh and Welsch (1983), is explicitly designed to detect and downweigh outliers in both the regressors' and residuals' spaces. Column (7)

[9] In other words, a Kuznets curve is clearly identifiable in this sample. Because a discussion of the Kuznets curve is not the focus of this paper, I do not pursue this controversial issue here.

presents the Krasker-Welsch estimate of MID in regressions (1) of Table 4. Once again, this estimate is very close to the OLS estimate.[10]

One could argue that the measurement error is likely to be more substantial in poor countries, as the accuracy of measures of income distribution probably increases with the level of GDP. In fact, the variance of the residuals from the basic regression of column (1) in Table 4 falls as GDP per capita increases. Column (8) presents results from WLS estimation, with the variance proportional to the inverse of GDP per capita. Indeed, both the point estimate and the t-statistic of the coefficient of MID almost double. Finally, in column (9) the standard errors are corrected with White's heteroskedasticity-consistent variance-covariance matrix, which is robust to general forms of heteroskedasticity and does not explicitly take into account the dependence of the variance on the level of GDP. In fact, the standard errors are very similar to those of the corresponding regressions in Table 4.

In conclusion, the basic reduced form relationship between income distribution and growth does not appear to be unduly influenced by outliers or heteroskedasticity. If anything, this relationship becomes much stronger if the poorest countries in the sample are dropped.

4.4 Democracy and income effects.

As discussed in section 2, the fiscal policy approach implies an important distinction between democracies and non-democracies in the way income distribution affects growth. One way to gauge the relevance of the fiscal policy approach is therefore to add an interactive term between MID and a democracy dummy variable to regression (1) in Table 4. If indeed income distribution is more important as a determinant of fiscal policy and growth in democracies, this interaction term should be positive. The definition of democracy is derived from Jodice and Taylor (1988), who assign a value of 1 to a democracy, .5 to a "semi-democracy", and 0 to dictatorships for each year in the 1960-85 period. To construct the dicothomous "democracy" dummy variable, I assign a value of 1 to a country if the

[10]The efficiency of the robust estimator, relative to the OLS estimator, is about .9 in both cases, indicating that it is quite easy for a country to be considered an outlier.

average value of the Jodice and Taylor definition over the 1960-85 period is greater than .5, and 0 otherwise. The 33 democracies resulting from the application of this criterion are listed in Table 3. Alternative classifications of democracies have been used by other researchers; the sensitivity of the results presented here to these alternative definitions will be discussed later.

Regression (1) in Table 6 shows that the coefficient of the interaction term $MID*DEM$ is very small and not significant. It is a regression like this that leads Alesina and Rodrik (1994) and Clark (1994) to question the relevance of the fiscal policy approach. If the error variance is different across the two samples, however, it might be more efficient to split regression (1) into two separate regressions, for democracies and non-democracies respectively. Columns (2) and (3) reveal that the coefficient of MID is indeed much higher - and highly significant - in democracies, while it is insignificantly different from 0 in non-democracies. This result obviously stands in sharp contrast with that of regression (1). A comparison of the coefficients of the human capital stock variables in regressions (2) and (3) provides the intuition for reconciling this difference. The coefficients of MSE and FSE are much larger in the sample of non-democracies. However, in regression (1) *all* coefficients, aside from that on income distribution, are constrained to be the same in the two samples. In the regression that pools both samples, the coefficients of MSE and FSE reflect heavily those of the sample of non-democracies. If one forced these coefficients to be so high in the sample of democracies, the behavior of MID also would reflect heavily that of the sample of non-democracies. These considerations suggest that the coefficients of MSE and FSE too should be allowed to vary between democracies and non-democracies, by adding an interaction term $MSE * DEM$ and $FSE * DEM$.[11] When this is done (column (4)), the coefficient of the interactive term, $MID * DEM$, almost doubles, with a t-statistic of 1.52.

The specification of column (4) is very similar to that adopted by Persson and Tabellini (1994). Besides the income distribution and democracy samples, the main difference is that they use the primary school enrollment ratio as a proxy for the stock of human capital. Primary enrollment is highly positively correlated with MID and it has a very large positive

[11] Allowing the coefficient of GDP to vary also does not alter the results.

coefficient in a growth regression on a sample of non-democracies. MSE and FSE are also highly positively correlated with MID, but their coefficients in a growth regression have opposite signs. Therefore, the difference between democracies and non-democracies in the effects of income distribution is larger when the flow, rather than the stock, of human capital is controlled for. In fact, if the primary enrollment ratio were used instead of MSE and FSE in column (4), the coefficient of $MID * DEM$ would be .155, with a t-statistic of 2.80. Based on this last specification, Persson and Tabellini argue strongly in favor of the fiscal policy approach. As shown above, Alesina and Rodrik (1994) and Clark (1994) reach the opposite conclusion on the basis of a specification like (1), again with primary enrollment rather than educational attainment as the human capital variable. The foregoing discussion shows that these differences can be explained in large part on the basis of the different specifications adopted.

One problem that makes it difficult to interpret the results obtained so far is the high correlation between the level of GDP per capita and the democracy dummy variable. Out of 33 democracies, the only countries with a GDP per capita below the cut-off value of $1,500 previously used to define poor countries are Botswana, India, Sri Lanka, Dominican Republic, Malaysia, and Colombia. If one splits the sample of countries into rich and poor, the results mimic those obtained when splitting the sample into democracies and non-democracies. Regressions based on the distinction between rich and poor countries are presented in Table 7; in column (4), which allows for the coefficients of the human capital variables to differ in the two samples, the coefficient of the interactive term $MID * RICH$ is .190, with a t-statistic of 2.08. Regressions (2) and (3) also show that the coefficient of MID is very high and significant in the sample of rich countries, and very low and insignificant in the sample of poor countries. These results persist if the cut-off level of GDP per capita is set at $1,000.

A lower coefficient of the income distribution variable in the sample of poor countries could be rationalized in a number of ways. Empirically, this is the result one should expect if measurement error problems are more serious in poor countries. Theoretically, as discussed in footnote 3 several models have the implication that, at low levels of income, equality might be less good for growth than at high levels of income, essentially because starting the process of development might require concentrating the little resources available in a relatively small group. Other possible explanations of the difference between poor and rich countries will be discussed later. But the basic point is simple: assuming they are robust, it is not clear whether the regularities highlighted in Table 6 can be attributed to a democracy effect rather than to an income effect.

In addition, the democracy effect does not appear to be robust. If one were to conduct a robustness analysis on the coefficient of $MID*DEM$ in regression (4) of Table 6, similar to the analysis of Table 5, the results would be rather disappointing. For instance, the exclusion of Venezuela alone causes the estimated coefficient of $MID * DEM$ to fall to .088, with a t-statistic of only (.98). The coefficient also falls to .084 (t-statistic: .97) when the 5 countries with slowest growth are excluded, and to .064 (t-statistic: .70) in the WLS regression. Finally, the Krasker-Welsch robust estimate, .087 (t-statistic: .84) is also considerably lower than the OLS estimate.

4.5 The role of different samples.

Besides specification, existing empirical studies on income distribution and growth differ along two other dimensions: the income distribution data and the definition of democracy. Persson and Tabellini define a democracy as a country that was a democracy according to Jodice and Taylor (1983) and Bank (1987) for more than 75% of the time. The definition adopted by Alesina and Rodrik is similar to mine, and is also based on Jodice and Taylor (1988). Gastil ranks countries in terms of "political rights" on a scale from 1 (the most democratic) to 7. This is the index used inbarro (1994). A dicothomous criterion based on the Gastil index could be to define a democracy as a country with an average value of the Gastil index between 1973 and 1985 (as reported in the Barro and Lee dataset) less than or equal to 3. Table 3 presents the samples of democracies based on the Persson and Tabellini definition and the Gastil index. Note that while the differences between the Gastil index and mine are very minor, the differences between the Persson-Tabellini index and mine are much more substantial. In particular, the former includes in the group of democracies the three Asian "tigers" for which income distribution data are available, Hong Kong, Korea and Taiwan, as well as several other African and Latin American countries.

Different studies are also based on different income distribution data. Persson and Tabellini derive their observations mainly from Paukert (1973), which forms the basis for some, but not all, of the data in Jain (1975). Alesina and Tabellini construct their dataset from Jain (1975) and Fields (1989).

I have run the regressions of Table 6 with all the possible combinations of the Persson and Tabellini democracy and income distribution samples with my democracy and income distribution samples. The picture that emerges from these regressions (not shown for brevity) leads to the same conclusions that have emerged so far[12]. The same applies if the Alesina and Rodrik (1994) income distribution data and sample of democracies are used, except that now the results (also not reported) are in general less strong.

Taken together, these results indicate that different income distribution datasets and definitions of democracy do not seem to be of crucial importance for the reduced form estimates of the effects of income distribution.[13] At the same time, the impression that the democracy effect is not very strong is confirmed. In fact, the coefficient of $MID * DEM$ is never significant in all the regressions with all the possible combinations of democracy samples and income distribution data.

4.6 Reduced form estimation: conclusions.

Four main messages seem to stand out from the battery of reduced form estimates and tests performed in this section:

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[12]As indicated above the Persson and Tabellini sample of democracies differs quite substantially from mine. Therefore, these findings are rather surprising. The explanation is that each sample includes some democracies that fit well the reduced form relationship between equality and growth, and that are not included in the other sample. Among the countries included in the Persson and Tabellini index but not in mine are some slow growers with high inequality (like Senegal, El Salvador and, with higher growth, Zimbabwe) and some fast growers with low inequality (like Taiwan and, especially, Korea). Conversely, my sample includes Botswana (with high growth and low inequality, given its level of development) and Chile (with the opposite pattern), both of which are not included in Persson and Tabellini's sample.

[13]This conclusion is subject to a qualification: when the primary school enrollment ratio is used as a proxy for initial human capital, then the Persson and Tabellini sample of democracies leads to much larger difference between democracies and non-democracies than my sample: see Perotti (1994b).

(1) There is a positive association between equality and growth, although a good deal of it is coming from intercontinental variation;

(2) This positive association is quantitatively much weaker, and statistically insignificant, for poor countries; however, this can be explained both on empirical and theoretical grounds;

(3) There is some indication that the association between equality and growth is stronger in democracies; however, the democracy effect does not seem to be very robust;

(4) Because of the high concentration of democracies in rich countries, it is virtually impossible to distinguish an income effect from a democracy effect in the relationship between income distribution and growth.

5 The fiscal policy approach.

This section begins the analysis of the various approaches that lead to the reduced form studied so far. Since the different explanations are not necessarily mutually exclusive, ideally one should estimate the specific channels *and* their interactions. However, taken literally this approach would require dealing with several endogenous variables at a time, and therefore would require estimating large systems with many parameters and interactive terms. There is no hope of achieving meaningful estimates of such systems with the small cross-section of income distribution data currently available. Hence, the strategy followed here consists in estimating different simple models, each embodying one of the channels surveyed above, and each consistent with the reduced forms estimated above.

Although the preliminary evidence on the fiscal policy approach, from the reduced form estimates of the previous section, is mixed at best, it is still interesting to study whether at least one of the two components can shed some light on our understanding of fiscal policy and/or growth.

The first preliminary question is what is the appropriate fiscal variable to test the fiscal policy approach. As the brief survey in section 2 showed, the link between income distribution and growth in this approach is the pression for redistribution that arises in highly unequal societies[14]. Hence, the first class of candidates includes those types of government expenditure that are explicitly redistributive in nature: social security and welfare, health and housing, and public expenditure on education. On the other hand, in these models what matters for growth is the distortions caused by the taxation that accompanies these redistributive expenditures. For instance, if taxation were lump-sum, a redistributive fiscal policy would have no distortionary effects on growth, because the marginal return to investment would not be affected[15]. Hence, the second class of candidates includes measures of taxation, like the average marginal tax rate, the average tax on labor, and the average personal income tax.[16]

I begin the test of the fiscal policy approach in Table 8 with estimates of the structural model using the average marginal tax rate between 1970 and 1985 ($MTAX$) as the fiscal policy variable. This measure has at least two advantages. First, relative to the other tax variables, it has the dimension of a marginal, rather than an average, tax rate and therefore it is conceptually the right measure of the distortionary effects of fiscal policy. Second, it is particularly appropriate in the context of the fiscal policy approach because in these models income distribution is an important determinant of the *progressivity* of the tax rate [17].

Each panel of Table 8 contains estimates of the two structural equations, the economic mechanism (result FP1 in section 2) and the political mechanism (result FP2), with GR and $MTAX$ as the dependent variables, respectively. In the first two columns, the sample

[14]The working of the economic and political mechanisms was illustrated in section 2 for the case of purely redistributive expenditure. A similar logic also applies to the case of directly productive government expenditure, as in Alesina and Rodrik (1994), although the mechanism is now slightly less straightforward since the negative growth effects of distortionary taxation must be weighed against the positive effects of public investment.

[15]A possible exception to this statement would occur if expenditure had direct distortionary effects, for instance because it distorts labor supply by increasing the reservation wage of unions. However, these effects are likely to be small compared to a direct tax effect.

[16]Like the expenditure variables, these variables come from Easterly and Rebelo (1993). Needless to say, all the expenditure and tax measures are far from perfect: see Easterly and Rebelo (1993) for a discussion of the problems involved.

[17]When taxes are linear and revenues are redistributed lump-sum, as in all the models surveyed in section 2, the degree of progressivity is related one-to-one with the *level* of the tax rate. However, in more general models, the two variables could be independent.

includes all the 49 countries for which data on $MTAX$ and MID are available. In the economic mechanism, column (1), the first three determinants of growth are standard and have been discussed previously: GDP, the stock of human capital, and $PPPI$. The fourth regressor, $MTAX$, proxies for the distortions caused by the financing of expenditure. The expected sign of its coefficient is therefore negative. In the political mechanism, column (2), there are three types of determinants of the average marginal tax rate. First, initial GDP, to capture the intuitive notions that richer countries and can afford to redistribute more income.[18] Second, the share of population over 65 years of age, on the ground that an older population implies a higher redistributive expenditure, particularly on social security and health, and that older individuals are likely to be less concerned with the slowdown of growth caused by higher tax rates[19]. Third, income distribution, as postulated by the theory tested here.

The key identifying assumptions are the exclusion of MID and $POP65$ from the economic mechanism and of human capital and of $PPPI$ from the political mechanism. The basic specification is necessarily parsimonious, given that it has to be consistent with the reduced forms estimated in the previous section. Within this constraint, however, the exclusion restrictions appear to be quite reasonable. Note also that in this specification GR does not appear on the RHS of the political mechanism equation[20]. This leads to a recursive (block-triangular) system that could be consistently estimated by OLS if the disturbances of the two equations are uncorrelated. However, if the disturbances are correlated, then only an instrumental variable procedure is consistent. The estimates displayed in Table 8 are obtained with a 2SLS procedure. Later, I discuss the relationship with OLS estimates later.[21].

[18]The notion that government expenditure is a luxury good is usually referred to as Wagner's law.

[19]Of course, this last statement assumes that a bequest motive is not fully operative. Also, the inclusion of $POP65$ is subject to the caveats discussed in section 4, since $POP65$ might really be proxying for fertility.

[20]If GR were included in the political mechanism, its coefficient would be very imprecisely estimated. However, this would not alter the estimated value of the other coefficients significantly.

[21]Of course, this issue is relevant only for the economic mechanism equation; the OLS and 2SLS estimates of the political mechanism equation are the same.

In column (1) the coefficient of $MTAX$ in the growth equation is positive, and highly significant, rather than negative as the theory would predict. This finding, already noted in reduced form regressions in Easterly and Rebelo (1993), is difficult to rationalize with most of the existing theories, that emphasize the distortionary effects of government expenditure and/or taxation. Note that these are all structural regressions: therefore, the usual justification for the positive coefficient of fiscal variables in growth equations, namely endogeneity, should not apply here.

In addition, in the political mechanism of column (2), income distribution plays essentially no role. In itself, this last finding is not necessarily inconsistent with the fiscal policy approach. An important prediction of this approach is that the pressure income distribution exerts on government expenditure and taxation would be felt more strongly in democracies. The relevant specification to test this theory would then include an interactive term $MID * DEM$, as well as the dummy variable DEM. The theory would predict that: (*i*) the coefficient of $MID * DEM$ should be negative, and (*ii*) regardless of what happens in non-democracies, the effect of an increase in equality on government expenditure and the marginal tax rate should be negative in democracies, i.e. the sum of the coefficients of MID and $MID * DEM$ should be negative.

In fact, the point estimates of the new specification (columns (3) and (4)) are consistent with both predictions[22]. In democracies, inequality does have a large effect on social security expenditure, while in non-democracies this effect is essentially zero. However, the coefficient on $MID * DEM$ is not even close to significant. The picture is slightly more favourable in columns (5) and (6), where the model is estimated on the sample of democracies only. Now the coefficient of MID is very large in absolute value, -1.906, implying that, in this sample, a *ceteris paribus* increase in the share of the middle class by 1% is associated with a reduction in the average marginal tax rate by almost 2% on average. The t-statistic on this coefficient also increases substantialy, to 1.42. Note, however, that in column (5) the marginal tax rate is still positively, rather than negatively, associated with growth.

[22]This specification also includes the two interactive terms $MSE * DEM$ and $FSE * DEM$, based on the discussion in section 3.

$POP65$, as expected, has a positive, and very significant, coefficient. In addition, if $POP65$ were omitted, MID would be insignificantly different from 0. The reason is that $POP65$ is positively related both to equality and to taxation. This illustrates the importance of controlling for demographic factors when testing for the effects of income distribution on fiscal policy.

These patterns persist when other fiscal policy variables are used rather than the average marginal tax rate, as in Table 9. For brevity, only estimates from regressions on the whole sample, on a specification like in columns (3) and (4) in Table 8, are included in this last table. In the first two lines of Table 9, I report 2SLS and OLS estimates of the fiscal policy variable in the economic mechanism. A comparison of OLS and 2SLS estimates is advisable because the instruments used for the fiscal policy variables in the economic mechanism (MID and $POP65$) might not be very good ones.

In the economic mechanism all 6 variables have positive coefficients; the only insignificant coefficients of the 2SLS estimates are those of public expenditure on education and, marginally, of personal taxation. Also, these results persist in the OLS regressions, although the size and the t-statistics of the estimated coefficients are generally lower. Therefore, not only taxation, but also redistributive expenditures are positively associated with growth in these structural regressions. Once again, these results are difficult to explain for virtually any of the existing standard economic and political models of fiscal policy. For social security and welfare expenditure (the single most important expenditure item between those employed here), these results can be explained in models where social security is a way to convince less productive individuals to leave the labor force (as in Sala-I-Martin (1992)), or it is part of an intergenerational contract that enhances social consensus and therefore investment, as in Bellettini and Berti-Ceroni (1995), or where redistributive expenditure in general is a way to overcome borrowing constraints and enable poor individuals to invest in human capital, as in Perotti (1993).

An even more important message of this table is that there is also very little evidence of a negative association between equality and fiscal variables in democracies. It is true that in the political mechanism, $MID * DEM$ has the expected negative sign in 4 cases out of

6, but social security and welfare is the only type of expenditure for which it is significant. Notice that in the case of personal income taxation the coefficient of MID is significantly *positive.*

Other robustness and sensitivity checks do not alter the two main messages of Table 8, namely the positive association between fiscal policy variables and growth and the very weak - or even inexistent - negative relationship between equality and fiscal variables. To conserve space, I will only discuss the main findings, without presenting the estimates in separate tables. First, the results do not change appreciably when other definitions of democracy or other income distribution datasets are used. Second, the results do not appear to be sensitive to omitted variables and to outliers. An important aspect that has been neglected so far is the role of cultural, religious and institutional factors in determining the size of the social security system. Adding regional dummies to the list of regressors in the political mechanism does not alter significantly the coefficients of the income distribution variables. One might also argue that more urbanized societies have larger social security systems, as both tax collection and the dispensing of subsidies is facilitated in an urban environment. Indeed, urbanization has a positive coefficient in the political mechanism, but again the income distribution coefficients do not change in any significant way. Finally, dropping one observation at a time in the specification of columns (3) and (4) of Table 8 or estimating the system using an instrumental variable extension of the Krasker-Welsch estimator also does not reveal any important outlier or group of outliers. Finally, like in the case of the reduced form regressions, if one were to divide the countries into rich and poor, rather than democracies and non-democracies, these two different ways to partition the sample would give very similar results. Once again, it is very difficult to distinguish an income effect from a democracy effect in this sample.

6 The political instability approach.

The basic intuition behind the socio-political instability approach, briefly presented in section 2, is quite straightforward.[23] In highly polarized societies, there are strong incentives for the different groups to organize and engage in activities outside the market and outside the usual channels of political representation in order to appropriate some of the resources of the other groups. The resulting uncertainty on the final distribution of resources creates disincentives to investment and growth.

To make this intuition operational, it is necessary to provide a measurable definition of instability. Schematically, one can think of two types of definitions. The first one focuses on executive instability, i.e. the frequency of government turnovers (see Alesina et al. (1992)). The second type of definition emphasizes phenomena of social unrest, both violent and non-violent, including those that do not find an expression in constitutional changes of government. Included in this definition are phenomena like political assassinations, mass demonstrations, political strikes, coups, etc. This second definition is closer to the idea briefly outlined in Section 2. Undoubtedly, one could also think of reasons why income distribution might affect executive turnover; however, in this case the link appears less direct.

The next issue then is how to make the second definition operational. Hibbs (1973), Venieris and Gupta (1983) and (1986), Gupta (1990), and Alesina and Perotti (1995) construct indices of socio-political instability by combining several indicators of social unrest using the method of the principal components. The index that will be used here is derived from Alesina and Perotti (1995).[24] The Alesina and Perotti index includes four proxies of social unrest, all from Jodice and Taylor (1988): political assassinations ($ASSASS$), violent deaths per million population ($DEATH$), successful coups ($SCOUP$), and unsuccessful coups ($UCOUP$). The rationale for the inclusion of these variables is quite obvious; also, the results do not change much if other available proxies of social unrest, like the

[23]The first part of this section is based heavily on Alesina and Perotti (1995).

[24]As shown below, the results do not change appreciably if the Venieris and Gupta index is used.

number of violent attacks or the number of strikes, are included. In addition, the index includes a fifth variable, the democracy dummy variable (DEM) used previously in testing the fiscal policy approach. The reason is twofold: first, in dictatorships episodes of social unrest tend to be underreported for propaganda reasons; second, because dictatorships repress manifestations of opposition, a given observed level of unrest is an indication of more serious problems in a dictatorship than in a democracy. Once again, the results are not sensitive to the inclusion of the democracy dummy variable[25]. The resulting index is given in the following expression:

$$SPI = 1.60ASSASS + 2.33DEATH + 7.29SCOUP + 6.86UCOUP - 5.23DEM \quad (1)$$

Table 10 displays estimates of different specifications of a simple structural model, which is consistent with the reduced forms estimated in section 4 and allows an explicit estimation of the two components of this approach, namely the link from income distribution to instability and the link from the latter to growth. The simplest specification is in the first two columns. Column (1) is the growth equation, corresponding to Result SPI1. The explanatory variables here are initial GDP per capita, human capital, and $PPPI$, all of which are standard, and the index of sociopolitical instability, SPI. Column (2) is the SPI regression, corresponding to Result SPI2 in Section 2. The dependent variable is the index of socio-political instability constructed above. The independent variables are: initial human capital, to capture the notion that education helps channel the manifestation of opposition into constitutional rules (see Huntington (1968)), and the share of the middle class[26] The identifying assumption is the exclusion of MID from the growth equation. Thus, in this first basic specification, the growth equation is exactly identified.

In both equations, all the coefficients have the expected signs. For brevity, I will concentrate on the coefficients of the two variables of interest in this approach, MID in the SPI equation and SPI in the growth equation. From column (1), a high share of the middle

[25]As it is well known, the method of principal components attributes larger weights to the variables that have larger order of magnitudes. Therefore, to construct the index of socio-political instability the variables listed above are first averaged over the period 1960-85 and then standardized

[26]Similarly to the fiscal policy approach, if one included GR in the SPI equation, its coefficient would be estimated very imprecisely, but the other coefficients would not be affected significantly.

class is associated with low political instability, and from column (2) the latter is associated with high growth.The effects implied by the estimates of their coefficients are definitely not negligible: an increase in the share of the middle class by one standard deviation decreases SPI by slightly more than half its standard deviation; in turn, this leads to an increase in the annual rate of growth of GDP by 1.1%.

The next panels of Table 10 show that these results are not sensitive to alternative specifications of the model. One may argue that socio-political instability is highly influenced by cultural factors. The inclusion of regional dummy variables (columns (3) and (4)) does not alter the basic picture: as expected, the coefficient of MID falls, although its t-statistic does not. In columns (5) and (6), the regressors of the SPI equation include a new variable, $HOMOG$, that represents the percentage of the population belonging to the main ethnic or linguistic group (see Canning and Fay (1993)). Thus, this variable captures the degree of fragmentation of the society, which is likely to be an important determinant of socio-political instability. As one can see, the results are virtually unaffected[27]. In the last two columns, the index of socio-political instability is from Gupta (1990), which is estimated on a larger sample of countries (about 100), uses different variables, and is based on the discriminant analysis rather than the principal component method. The results are surprisingly close to those obtained before. An increase in the share of the middle class by one standard deviation is associated with a fall in the index of about 1/3 of its standard deviation, which in turn is associated with an increase in growth by about .8%.

In principle, one could also imagine a host of reasons why the level of GDP per capita might be an important determinant of socio-political instability. However, the inclusion of GDP in the SPI equation (not shown) does not change any of the coefficients of interest. Also, a long tradition in economics, going back at least to Kaldor (1956), has argued that the (functional) distribution of income is an important determinant of investment and growth, since capitalists and workers have different propensities to save. However, when

[27]Virtualy identical results obtain when the index of ethnolinguistic fractionalization of Mauro (1995) is used instead of $HOMOG$. The difference between the two indices is that the Mauro index takes into account not only the largest group, but all ethnic and linguistic groups in a country: formally, it measures the probability that two randomly selected persons belong to two different groups.

MID is included in the growth equation directly (also not shown), its coefficient is not significant, and the coefficient of MID in the SPI equation is not affected.

The results presented so far do not change significantly when the system is estimated by dropping one observation at a time, and by applying the Krasker-Welsch 2SLS robust estimator. However, these robust estimators might fail to detect the influence of *groups* of countries with extreme values of certain important variables. This could be a particularly serious problem here, because the distribution of the SPI index has a very fat left tail and a very thin but long right tail. In fact, notice from Table 3 that most rich countries have very low values of the SPI index, clustered around the minimum possible value of -.012. By contrast, there are only 8 countries with a value of the index that exceeds the average by more than 1 standard deviation. Thus, one might suspect that the results obtained so far might be due to these few very unstable countries, that in many cases have also relatively slow growth rates and quite unequal distributions of income.

To check for this possibility, Table 11 reestimates the model excluding countries with extreme values of several variables. For brevity, only the coefficient of MID in the SPI equation and of SPI in the growth equation are reported. For the latter coefficients, the table presents both the 2SLS and the OLS estimates. This might be particularly important in this context, and for a rather subtle reason. In the specification adopted, SPI in the growth equation is instrumented by MID. In some cases, as countries with very large values of the SPI index are excluded, the SPI index might not have much variation, as it was argued above. As a result, MID might be a very poor instrument, and the second stage regression might be subject to a large multicollinearity problem. The 2SLS estimate of the coefficient of SPI in the growth equation might therefore be very unstable and imprecise.

As a reference, column (1) presents estimates based on the whole sample, in a specification like columns (1) and (2) of Table 10. Column (2) excludes countries with a value of the SPI index more than 1.5 standard deviations above the average. The 2SLS estimate of the SPI coefficient becomes extremely imprecise, as implied by the argument developed above; by contrast, the OLS estimate falls only slightly. The coefficient of MID in the SPI equation falls, but remains significant. Column (3) excludes countries with very unequal income distribution, corresponding to a share of the middle class more than 1.5 standard deviations below the mean. This clearly does not affect the point estimates of the coefficients of interest. Columns (4), (5) and (6) clearly show that, as usual, the estimated relationship is much stronger in rich countries.

Based on the results of the previous sections, one might legitimately ask whether the regressions of this section would be different in democracies and non-democracies. One might argue that in highly polarized and unstable societies one of the groups is more likely to seize power and install a dictatorship as a way to protect its interests. Under this explanation, democracies would grow faster exactly because they tend to be the less polarized and unstable countries. Columns (7), (8) and (9) show that there is no appreciable difference between democracies and non-democracies in the effects of income distribution on political instability, although now the coefficients of MID are very low and imprecisely estimated in both samples. [28]

7 The imperfect capital market and endogenous fertility approaches.

In both the imperfect capital market and the endogenous fertility approach, the relevant human capital investment decision is likely to be secondary school enrollment. The direct costs of both primary and secondary schooling are very low virtually everywhere, since secondary education is practically free, or heavily subsidized, in most countries of the sample, including developing countries. However, the opportunity costs of secondary education are much higher, particularly in developing countries, than those of primary education. Primary education is also compulsory in practically all countries, while the same is not true for secondary education, particularly at the beginning of the sample; moreover, the level

[28] Note that, if one tried to estimate the system with 2SLS on the sample of democracies and non-democracies separately, the estimate of the SPI coefficient would be very imprecise, due to the little variation in SPI in the sample of democracies. For this reason, only OLS estimates are presented in Table 11.

of enforcement is much lower in the case of secondary education.

Table 12 begins the investigation of these two approaches[29]. I first estimate a two-equation system with growth and fertility ($FERT$) as the endogenous variables. Following Barro and Sala-I-Martin (1995), the measure of fertility employed here is the average of the 1965 and 1985 values of this variable. The first two columns of the table present the 2SLS and OLS estimates of the growth regression, respectively. As expected, fertility has a large and highly significant negative coefficient in the growth regression. This confirms results obtained by, among others, Barro (1991), Barro and Sala-I-Martin (1995), and Galor and Zang (1993). In addition, the 2SLS and OLS estimates of this equation are very similar. For this reason, and to conserve space, when I perform some sensitivity analysis on the fertility regression, I will not report the corresponding estimates of the growth regression.

In column (3), fertility depends on initial GDP, on educational attainment, and on MID. Consistent with the discussion of section 2, the coefficient of MID is negative, very large in absolute values, and higly significant. An increase in the share of the middle class by one standard deviation is associated with a fall in fertility by .5 surviving child per woman. The other coefficients also have the expected sign, with the usual exception of female educational attainment: a higher female educational attainment is associated with a higher fertility rate. This finding seems hard to explain for any reasonable theory of fertility. More than anything, it probably indicates that the measure of educational attainment used so far suffers from high measurement error. In fact, if one also controls for both male and female secondary school enrollment ratios ($MSEC$ and $FSEC$, respectively) in the fertility regression, as in column (4), the coefficients of these last two variables are eminently reasonable: that of male secondary enrollment ratio is insignificantly different from zero, while that of female secondary enrollment ratio is negative and highly significant.

Note that controlling for female secondary enrollment causes the coefficient of MID to fall by about 40%; this is not surprising, since according to the endogenous fertility aproach, secondary school enrollment should be negatively correlated with fertility, and positively

[29]It is clear that the relevant concept in these two approaches is the distribution of wealth, rather than income. Because the former is available for very few countries, I will continue to use the latter in the empirical analysis that follows.

with growth. Of course, this also implies that secondary school enrollment ratios are jointly endogenous with fertility, an issue to which I will return shortly. Even more than in the case of schooling, it is hard to ignore cultural factors as determinants of fertility. Column (5) includes regional dummies for Latin America, Africa and Asia: all their coefficients are positive, as expected; also as expected, the coefficient of MID declines slightly in size, but remains significant[30]

Table 13 investigates the relationship between income distribution and secondary school enrollment. I start with the female secondary enrollment ratio. As in Table 12, columns (1) and (2) present the 2SLS and OLS estimates of the growth regression, where the rate of growth between 1960 and 1985 depends on initial GDP per capita, $PPPI$ and secondary school enrollment. The predicted sign of this coefficient is obviously positive.

In column (3), secondary school enrollment depends on the level of GDP per capita in 1960, on the usual measures of educational attainment, and on the share of the middle class. The endogenous fertility approach would predict a positive coefficient on all three types of variables. In richer countries and in countries with a higher stock of human capital, for any given distribution of human capital the average return to education is higher and therefore the investment in education is higher. Conversely, given the average stock of human capital, a more equal distribution of it should imply that more individuals respond to the higher return on education by investing in human capital.

These predictions are strongly supported by the estimates of columns (1) to (3). In particular, in both columns (1) and (2), the coefficient of $FSEC$ is positive and extremely significant, although now it is twice as large in the 2SLS estimate than in the OLS estimate. In column (3), the coefficient of MID is positive and significant. A difference in one standard deviation of the share of the middle class is associated with a difference in female secondary school enrollment ratio of about 6.5%. As usual, the only coefficient that turns out with an unexpected sign is the female educational attainment measure.

Columns (4) to (6) present the same regressions as columns (1) to (3), except that now

[30] Life expectancy is also often used as an explanatory variable for fertility. In fact, when life expectancy is included among the regressors of the fertility equation, its coefficient turns out to be negative and significant; however, the coefficient of MID falls only slightly.

the second endogenous variable is male secondary school enrollment, rather that the female one. Interestingly, the two sets of estimates are very similar. For this reason, from now on I will present results pertaining to female secondary school enrollment only.

One could argue that secondary school enrollment is highly influenced by cultural factors and other characteristics that are not likely to be picked up by the level of GDP per capita. Column (7) adds continental dummies to the RHS of the regression of column (3); Sub-Saharan countries do have significantly lower-than-average enrollment ratios, given their GDP per capita, but the coefficient of MID is not significantly affected.

In column (8), I add fertility on the RHS of the previous regression. As discussed above, in the endogenous fertility approach fertility and investment in education are two different forms of investment, and are jointly determined. By comparing column (5) of Table 12 to column (8) in this table, one can study the the interaction between fertility and investment in education. The main findings can be summarized as follows. The coefficient of fertility in the enrollment ratio regression of column (8) is negative and highly significant. Income distribution retains almost no independent explanatory power. In the fertility equation (column (5) of Table 12), as shown above the female enrollment ratio has a negative and significant coefficient. The income distribution variable falls slightly when secondary school enrollment is controlled for, but remains economically and statistically significant.

These findings are again largely consistent with plausible extensions of models of endogenous fertility. In these models, the main source of variation in returns to investment in schooling is the rate of fertility (see e.g. Becker, Murphy and Tamura (1989)). Therefore, income distribution largely affects investment in education through its effects on the rate of fertility. Once the rate of fertility is controlled for, one would expect a fall in the coefficient of MID in the enrollment regressions. However, even after controlling for investment in human capital, MID still has a significant explanatory power for fertility. Thus, holding constant the return to human capital investment, income distribution still affects other determinants of fertility. For instance, if the time devoted to raising children increases with human capital, but at decreasing rates, a redistribution of human capital to the poor is likely to reduce the rate of fertility.

As discussed above, according to both approaches one should expect a weaker effect of income distribution on primary school enrollment ratios. This is in fact the case: if secondary school enrollment were replaced by primary school enrollment in all the regressions of Table 12, the estimated coefficient of MID in the primary school enrollment equation would now be *negative.* The fit of the regressions (not reported to conserve space) also drops drastically.

The evidence presented so far, particularly in Table 13, is also consistent with the imperfect capital market approach. This approach too would predict a positive coefficient on all three types of determinants of secondary school enrollment in columns (3) and (6). In richer societies, given the distribution of income, fewer agents are so poor or have such a low marginal utility that they cannot afford or do not want to send their children to school. Conversely, given the average income of the economy, in more equal societies more agents will be away from the corner and will be able to invest in their children's human capital.

In principle, however, there are more direct ways to test for the role of imperfect capital market in the transmission of the effects of income distribution. If a measure of the degree of imperfection in capital markets were available, one could interact it with the income distribution variable and estimate its coefficient. One such measure is the loan-to-value ratio for home mortgages, assembled by Jappelli and Pagano (1994). However, this measure is available for only about 20 countries with income distribution data, and all of them high-income countries. Perhaps not surprisingly, the coefficients of the income distribution variable and of the interactive terms turn out to be insignificant. De Gregorio (1994) and others use the ratio of domestic credit to GDP as a measure of the development of credit markets. This variable is available for a slightly larger sample, but it is also a very crude approximation to the concept of borrowing constraints. Again, regressions using this variable gave inconclusive results.

One possible way to discriminate between the two approaches is to look at how the link between income distribution on one side and enrollment ratios and fertility on the other varies with the level of development. Table 14, which displays only the coefficients of interest in regressions for schooling and fertility, shows clearly that the coefficient of income distribution is about twice as large in the sample of rich countries, both in the enrollment ratio and in the fertility regression. As usual, a bigger measurement error problem in poor countries is a possible cause of this result. However, this is also the result that one would expect on the basis of a model like Becker, Murphy and Tamura (1991). In fact, its crucial feature is that the returns to education are low at low levels of human capital. This is particularly true for poor individuals in poor countries. Therefore, in poor countries a redistribution of human capital to poor individuals causes a fall in fertility (the estimates of the previous table suggest that even in very poor countries the substitution effect of an increase in human capital prevails over the income effect) but small movements in investment in education. In richer countries, the returns to investment in education at low levels of human capital are higher, and therefore both schooling and fertility are more responsive to a redistribution of human capital.

A higher coefficient of the income distribution variable in rich economies is more difficult to rationalize in the context of the imperfect capital market approach. One would expect borrowing constraints to be more important in poor than in rich countries. Accordingly, a redistribution of income to the poor would be more effective in relaxing borrowing constraints in a poor economy. On the other hand, the imperfect capital market approach does offer an alternative explanation why equality might not have a positive impact on growth in poor economies. As discussed in footnote 3, this would be the case if, for instance, there are fixed costs of investment in human capital; only if wealth is relatively concentrated will *some* individuals be able to start investing.

8 Conclusions.

More equal societies have lower fertility rates and higher rates of investment in education. Both are reflected in higher rates of growth. Also, very unequal societies tend to be politically and socially unstable, which is reflected in lower rates of investment and therefore growth. Finally, the data do not support the idea that more equal societies, particularly those with democratic institutions, grow faster because they generate less demands for redistribution and therefore less distortions.

Table 1: **Summary statistics.**

variable	ave.	st. dev.	min.	max.
GR	0.024	0.017	-0.016	0.066
MID	0.342	0.053	0.225	0.420
$PTMID$	0.136	0.031	0.080	0.188
GDP	2.190	1.878	0.208	7.380
MSE	0.744	0.663	0.024	2.790
FSE	0.558	0.664	0.003	2.949
$PPPI$	0.679	0.218	0.260	1.516
SS	0.058	0.055	0.000	0.191
HH	0.031	0.020	0.004	0.091
ED	0.033	0.017	0.003	0.067
$MTAX$	0.282	0.150	-0.008	0.678
$LTAX$	0.112	0.067	0.010	0.327
$PTAX$	0.047	0.039	0.000	0.136
URB	0.439	0.249	0.040	0.890
$POP65$	0.061	0.038	0.024	0.153
$MSEC$	0.481	0.260	0.035	0.960
$FSEC$	0.431	0.276	0.015	0.935
$FERT$	4.054	1.512	1.852	7.164
$HOMOG$	0.606	0.283	0.070	0.990
$SPIG$	0.180	0.051	0.114	0.282
SPI	0	0.013	-.012	0.043
$LIFEEX$	56.598	12.112	31.500	73.400

See the Appendix for definition of variables.

Table 2: **Correlation matrix, selected series.**

	GR	*MID*	*PTMID*	*GDP*	*MSE*	*FSE*	*PPPI*	*DEM*	*PTDEM*	*RICH*
GR										
MID	0.33									
PTMID	0.39	0.73								
GDP	-.01	0.58	0.52							
MSE	0.30	0.53	0.49	0.63						
FSE	0.14	0.52	0.47	0.71	0.94					
PPPI	-.02	0.17	0.11	0.22	0.16	0.19				
DEM	0.16	0.51	0.47	0.63	0.43	0.48	0.07			
PTDEM	0.19	0.36	0.43	0.41	0.39	0.37	0.25	0.62		
RICH	0.10	0.51	0.29	0.79	0.50	0.54	0.08	0.58	0.33	
SS	0.10	0.63	0.45	0.69	0.39	0.39	0.02	0.55	0.28	0.65
MTAX	0.17	0.42	0.28	0.36	0.21	0.15	0.03	0.39	0.34	0.41
LAAM	-.27	-.42	-.40	-.09	-.12	-.08	-.02	0.04	-.03	-.01
ASIA	0.45	-.05	0.15	-.20	0.11	-.08	0.09	-.20	0.14	-.20
AFR	-.32	-.29	-.28	-.42	-.39	-.33	-.07	-.43	-.42	-.42
URB	0.16	0.45	0.33	0.78	0.64	0.63	0.14	0.53	0.40	0.80
POP	0.26	0.71	0.57	0.79	0.52	0.56	0.05	0.66	0.43	0.68
MSEC	0.47	0.64	0.57	0.70	0.64	0.63	0.10	0.57	0.55	0.65
FSEC	0.41	0.64	0.58	0.79	0.69	0.68	0.15	0.68	0.53	0.73
FERT	-.41	-.73	-.54	-.78	-.62	-.58	-.05	-.67	-.49	-.76
SPI	-.38	-.35	-.36	-.39	-.19	-.40	-.22	-.06	-.03	-.40

	SS	*LTAX*	*LAAM*	*ASIA*	*AFR*	*URB*	*POP*	*MSEC*	*FSEC*	*FERT*
SS										
LTAX	0.71									
LAAM	-.22	-.37								
ASIA	-.28	-.15	-.18							
AFR	-.34	-.12	-.30	-.16						
URB	0.68	0.37	0.15	-.06	-.59					
POP	0.87	0.38	-.23	-.19	-.41	0.67				
MSEC	0.60	0.46	-.18	0.10	-.64	0.75	0.76			
FSEC	0.71	0.50	-.08	0.02	-.63	0.80	0.85	0.92		
FERT	-.78	-.51	0.17	0.02	0.63	-.78	-.89	-.90	-.92	
SPI	-.44	-.34	0.27	-.03	0.19	-.30	-.50	-.50	-.53	0.50

See the Appendix for definition of variables.

Table 3: **Detailed data, *GDP*, *MID* and *SPI*.**

country	*GDP*	*MID*	*SPI*	dem.	country	*GDP*	*MID*	*SPI*	dem.
Tanzania	0.208	0.31	-0.06		Jamaica	1.472	0.30	-1.03	P,PT,G
Malawi	0.237	0.32	-0.25		Greece	1.474	0.37	0.20	P,PT,G
Sier. Leo.	0.281	0.30	0.88		Costarica	1.663	0.28	-1.19	P,PT,G
Niger	0.284	0.39	0.34		Cyprus	1.692	0.41	0.21	P,PT,G
Myanmar	0.306	0.38	0.18		Peru	1.721	0.30	0.74	
Togo	0.415	0.40	0.67		Hong Kong	1.737	0.35	NA	PT
Bangladesh	0.444	0.38	0.83	PT	Barbados	1.747	0.37	-1.20	P,PT,G
Kenya	0.470	0.22	-0.05		Iran	1.839	0.30	-0.06	
Botswana	0.493	0.33	-0.98	P,G	Mexico	2.157	0.31	-0.43	P,PT
India	0.533	0.35	-0.87	P,PT,G	Japan	2.239	0.39	-1.19	P,PT,G
Pakistan	0.558	0.37	1.84		Spain	2.425	0.38	-0.26	G
Congo	0.563	0.29	2.26		Iraq	2.527	0.27	3.16	
Benin	0.595	0.33	2.94	PT	Ireland	2.545	0.40	-1.14	P,PT,G
Zimbabwe	0.615	0.24	0.04	PT	S. Africa	2.627	0.36	-0.69	
Sudan	0.667	0.35	1.57		Israel	2.838	0.40	-1.16	P,PT,G
Thailand	0.688	0.29	0.91		Chile	2.932	0.31	0.05	P
Korea	0.69	0.41	NA	PT	Argentina	3.091	0.33	3.10	
Zambia	0.740	0.29	-0.21		Italy	3.233	0.38	-0.77	P,PT,G
Honduras	0.748	0.25	0.49		Uruguay	3.271	0.38	0.46	P,PT
Senegal	0.756	0.26	-0.12	PT	Austria	3.908	0.42	-1.19	P,PT,G
Tunisia	0.852	0.34	-0.08		Finland	4.073	0.40	-1.19	P,PT,G
Taiwan	0.866	0.34	NA	PT	France	4.473	0.35	-0.96	P,PT,G
Philip.	0.874	0.31	-0.36	PT	Netherland	4.690	0.39	-1.19	P,PT,G
Bolivia	0.882	0.28	4.36		U.K.	4.970	0.40	-0.71	P,PT,G
Dom. Rep.	0.956	0.32	1.20	P,PT,G	Norway	5.001	0.40	-1.20	P,PT,G
Sri Lanka	0.974	0.34	-0.87	P,PT,G	Sweden	5.149	0.42	-1.19	P,PT,G
El Salv.	1.062	0.27	0.80	PT	Australia	5.182	0.41	-1.19	P,PT,G
Malaysia	1.103	0.29	-1.06	P,PT,G	W. Germany	5.217	0.38	-1.16	P,PT,G
Ecuador	1.143	0.23	1.91		Venezuela	5.308	0.31	0.37	P,PT,G
Panama	1.255	0.32	0.29	PT	Denmark	5.490	0.42	-1.20	P,PT,G
Turkey	1.255	0.30	0.53	PT,G	N. Zealand	5.571	0.39	-1.20	P,PT,G
Brazil	1.313	0.30	-0.01		Canada	6.069	0.41	-1.19	P,PT,G
Colombia	1.344	0.31	-0.46	P,PT,G	Switzerland	6.834	0.42	-1.20	P,PT,G
					U.S.	7.380	0.41	-1.11	P,PT,G

See the Appendix for definition of variables. "P": Perotti. "P-T": Persson and Tabellini (1994). "G": Gastil (various years), from Barro and Lee (1993). Values of the SPI index are multiplied by 100.

Table 4: **Reduced form regressions.**

	(1)	(2)	(3)	(4)	(5)
constant	-.018 (-1.37)	.003 (.21)	-.018 (-1.31)	-.007 (-.50)	-.049 (-3.43)
GDP	-.002 (-1.77)	-.003 (-2.21)	-.003 (-1.48)	-.006 (-3.25)	-.006 (-3.87)
MSE	.031 (4.05)	.016 (1.94)	.028 (3.44)	.031 (4.23)	.021 (2.94)
FSE	-.025 (-3.06)	-.011 (-1.32)	-.024 (-2.79)	-.024 (-3.00)	-.018 (-2.36)
PPPI	-.002 (-.30)	-.004 (-.48)	-.003 (-.32)	.004 (.45)	.0001 (.016)
MID	.118 (2.84)	.082 (1.81)	.111 (2.60)	.047 (1.02)	.083 (2.14)
LAAM		-.008 (-1.71)			
ASIA		.011 (1.59)			
AFR		-.013 (-2.48)			
URB			008 (.69)		
*POP*65				.241 (2.82)	
LIFEEX					.0009 (4.05)
nobs	67	67	64	67	65
R^2	.30	.40	.26	.37	.45

Dependent variable: *GR*. t-statistics in parentheses. See the Appendix for definition of variables.

Table 5: **Reduced form regressions, robust estimators.**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
MID	. 136 (3.19) Togo	.093 (2.26) Venez.	.107 (1.95)	.100 (2.49)	.102 (2.61)	.168 (3.51)	.101 (2.09)	.208 (4.79)	.118 (2.95)
nobs	66	66	59	62	62	58	67	67	67

Dependent variable: *GR*. t-statistics in parentheses. See the Appendix for definition of variables. In each columns, the coefficient of *MID* is estimated from a regression like (1) in Table 4. Column (1) reports the maximum value of the estimated coefficient in all the 67 regressions that leave out one country at a time. In parentheses the associated t-statistics and the country whose omission generates the reported value of the coefficient. Column (2) reports the minimum value of the estimated coefficient, found in a similar way. In column (3), all countries with a value of *MID* more than 1.5 standard deviations below the average are excluded. In column (4), all countries with a growth rate more than 1.5 standard deviations above the average are excluded. In column (5), all countries with a growth rate more than 1.5 standard deviations below the average are excluded. In column (6), all countries with a per capita GDP in 1960 less than $500 are excluded. Column (7) reports the Krasker-Welsch robust estimates of the coefficient. Column (8) reports the WLS estimator. In column (9), the standard errors are corrected using the White heteroskedasticity-consistent estimator of the variance-covariance matrix.

Table 6: **Reduced form, democracy effect.**

	(1)	(2)	(3)	(4)
sample	all	dem.	nondem.	all
constant	-.008	-.030	-.016	-.007
	(-.50)	(-1.13)	(-.95)	(-.45)
GDP	-.004	-.004	.0007	-.004
	(-2.35)	(-2.55)	(.17)	(-2.63)
MSE	.032	.009	.042	.040
	(4.20)	(.82)	(3.37)	(3.44)
FSE	-.027	-.008	-.033	-.026
	(-3.24)	(-.73)	(-1.50)	(-1.31)
$PPPI$	.0002	-.009	.015	.0004
	(.02)	(-.81)	(1.21)	(.05)
MID	.178	.203	.050	.064
	(1.51)	(2.76)	(.93)	(1.25)
$MID * DEM$	080			.139
	(.88)			(1.52)
DEM	-.020			-.029
	(-.66)			(-.97)
$MSE * DEM$				-.029
				(-1.76)
$FSE * DEM$				.015
				(.68)
nobs	67	33	34	67
R^2	.31	.27	.43	.35

Dependent variable: GR. t-statistics in parentheses. $MID * DEM$: MID interacted with the democracy dummy variable. Similarly for $MSE * DEM$ and $FSE * DEM$. See the Appendix for definition of other variables.

Table 7: **Reduced form, income effect.**

	(1)	(2)	(3)	(4)
sample	all	rich	poor	all
constant	-.0009	-.047	-.019	-.018
	(-.05)	(-2.24)	(-.93)	(-.10)
GDP	-.005	-.006	.011	-.005
	(-2.33)	(-3.28)	(1.23)	(-2.62)
MSE	.030	.019	.046	.042
	(4.01)	(2.30)	(3.01)	(2.98)
FSE	-.026	-.018	-.052	-.031
	(-3.16)	(-1.99)	(-1.90)	(-1.36)
$PPPI$	.001	-.002	.009	.003
	(.13)	(-.25)	(.77)	(.36)
MID	.059	.243	.057	.047
	(1.12)	(4.00)	(.95)	(.87)
$MID * RICH$	.148			.190
	(1.67)			(2.08)
$RICH$	-.042			-.048
	(-1.48)			(-1.65)
$MSE * RICH$				-.022
				(-1.29)
$FSE * RICH$				.013
				(.53)
nobs	67	32	35	67
R^2	.32	.50	.26	.33

Dependent variable: GR. t-statistics in parentheses. $MID * RICH$: MID interacted with the democracy dummy variable. Similarly for $MSE * RICH$ and $FSE * RICH$. See the Appendix for definition of other variables.

Table 8: **Economic and political mechanisms.**

	(1)	(2)	(3)	(4)	(5)	(6)
dep. var.	*GR*	*MTAX*	*GR*	*MTAX*	*GR*	*MTAX*
sample	all		all		dem.	
constant	.004 (.47)	.164 (1.13)	.005 (.65)	.185 (1.23)	.020 (2.30)	.715 (1.86)
GDP	-.004 (-2.39)	-.021 (-1.50)	-.002 (-1.26)	-.022 (-1.37)	-.002 (-1.02)	-.020 (-.98)
MSE	.004 (.38)		.040 (2.88)		-.020 (-1.52)	
FSE	.001 (.10)		-.046 (-2.38)		.020 (1.64)	
PPPI	-.0005 (-.07)		.008 (1.03)		-.016 (-1.64)	
MTAX	.090 (3.61)		.091 (3.73)		.068 (3.18)	
MID		-.096 (-.19)		-.222 (-.45)		-1.906 (-1.42)
$MID * DEM$				-.901 (-.88)		
DEM				.329 (.99)		
*POP*65		3.047 (3.78)		3.553 (3.61)		4.430 (3.28)
nobs	49	49	49	49	27	27
R^2	.22	.30	.24	.29	.30	.29

2SLS. t-statistics in parentheses. See the Appendix for definition of variables.

Table 9: **Other fiscal policy variables.**

		(4)	(5)	(6)	(1)	(2)	(3)
		$MTAX$	$LTAX$	$PTAX$	SS	HH	ED
ec. mech.,IV	$FISC.POL.$ $VAR.$,	.090 (3.73)	.246 (3.07)	.394 (1.91)	.254 (3.46)	.669 (3.44)	.200 (.61)
ec. mech.,OLS	$FISC.POL.$ $VAR.$	.014 (.96)	.83 (2.08)	.108 (1.64)	.102 (1.92)	.275 (2.64)	.053 (.40)
	MID	-.222 (-.45)	-.196 (-.96)	-.069 (-.47)	-.005 (-.41)	-0.120 (-1.57)	-0.134 (-1.81)
pol. mech.	$MID * DEM$	-.901 (-.88)	-.137 (-.41)	.504 (2.09)	-.407 (-1.98)	-0.029 (-0.23)	0.103 (0.81)
	$POP65$	3.553 (3.61)	1.202 (3.63)	-.014 (-.06)	1.433 (7.27)	0.406 (3.25)	0.100 (0.81)
nobs		49	50	48	54	46	47

The first two rows refer to the economic mechanism; the dependent variable is GR. Each entry in these two rows reports the 2SLS (first row) and OLS (second row) estimate of coefficient of the fiscal policy variable at the top of each column in a regression like (3) in Table 8. The last three rows refer to the political mechanism; the dependent variable is the fiscal policy variable at the top of each column. Each entry is the estimate of the coefficients of MID (third row), $MID * DEM$ (fourth row), and $POP65$ (fifth row) in a regression like (4) in Table 8. $MTAX$: marginal tax rate; $LTAX$: labor taxation; $PTAX$: average personal income tax rate; SS: social security and welfare; HH: health and housing; ED: public expenditureon education. See the Appendix for definition of variables.

Table 10: **Socio-political instability.**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
dep. var.	*GR*	*SPI*	*GR*	*SPI*	*GR*	*SPI*	*GR*	*SPIG*
constant	.034 (3.46)	.021 (3.26)	.034 (3.72)	.023 (1.70)	.035 (3.58)	.035 (3.54)	.143 (1.79)	.310 (8.14)
GDP	-.004 (-1.81)		-.004 (-1.99)		-.004 (-1.84)		-.007 (-1.55)	
MSE	.028 (2.63)	.006 (1.20)	.028 (2.32)	.009 (1.16)	.026 (1.97)	.005 (.63)	.013 (.72)	-.016 (-.55)
FSE	-.025 (-2.05)	-.009 (-1.20)	-.025 (-2.04)	-.012 (-1.62)	-.024 (-1.77)	-.007 (-.91)	-.012 (-.74)	-.008 (-.28)
PPPI	-.014 (-1.32)		-.014 (-1.36)		-.014 (-1.32)		-.015 (-1.04)	
SPI	-1.495 (-2.27)		-1.555 (-2.82)		-1.606 (-2.54)		-.532 (-1.58)	
MID		-.090 (-2.11)		-.071 (-1.94)		-.093 (-2.94)		-.334 (-2.84)
LAAM				.004 (1.09)				
ASIA				-.006 (-.08)				
AFR				.003 (.78)				
HOMOG						-.006 (-1.09)		
nobs	64	64	64	64	60	60	63	63
R^2	.15	.23	.21	.22	.19	.24	.14	.30

2SLS. t-statistics in parentheses. See the Appendix for definition of variables.

Table 11: **Socio-political instability, sensitivity and robustness.**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
SPI, IV	-1.495 (-2.64)	-3.346 (-1.20)	-1.267 (-2.47)	-1.640 (-2.84)	-1.598 (-4.03)	-1.862 (-.53)	-2.193 (-2.47)		
SPI, OLS	-.563 (-3.73)	-.471 (-1.96)	-.620 (-4.05)	-.570 (-3.66)	-.882 (-4.46)	-.303 (-1.35)	-.651 (-3.54)	-.862 (-2.09)	-.461 (-2.10)
MID	-.089 (-2.90)	-.050 (-2.26)	-.114 (-3.19)	-.019 (-.46)	-.150 (-3.53)	-.019 (-.41)	.032 (-.89)	-.031 (-1.02)	-.033 (-.69)
$MID * RICH$				-.130 (-2.00)					
$MID * DEM$							.002 (.04)		
nobs	64	60	59	64	31	33	64	34	31

The first two rows refer to the growth equation; the dependent variable is *GR*. Each entry in these two rows reports the 2SLS (first row) and OLS (second row) estimate of the coefficient of *SPI* in a regression like (1) in Table 10. The last three rows refer to the *SPI* equation. Each entry is the estimate of the coefficients of *MID* (third row), $MID * RICH$ (fourth row), or $MID * DEM$ (fifth row) in a regression like (2) in Table 10. Column (1) displays estimates from the whole sample. In column (2), all countries with *SPI* index more than 1.5 standard deviations above the average are excluded. In column (3), all countries with a share of the middle class more than 1.5 standard deviations below the average are excluded. Regression (4) is estimated on the whole sample, allowing for a different coefficient of *MID* in rich and poor countries. Regressions (5) and (6) are estimated on the sample of rich and poor countries, respectively. Regression (7) is estimated on the whole sample, allowing for a different coefficient of *MID* in democracies and non-democracies. Regressions (8) and (9) are estimated on the sample of democracies and non-democracies, respectively.

Table 12: **Fertility.**

	(1)	(2)	(3)	(4)	(5)
dep.var.	*GR*, IV	*GR*, OLS	*FERT*	*FERT*	*FERT*
constant	.101 (6.27)	.078 (1.03)	8.903 (11.92)	8.114 (16.98)	7.270 (9.43)
GDP	-.010 (-4.45)	-.007 (-4.37)	-.466 (-5.63)	-.133 (-1.90)	-.109 (-1.46)
PPPI	.011 (1.29)	.010 (1.37)			
FERT	-.016 (-5.10)	-.012 (-6.01)			
MSE			-1.380 (-3.19)	-.619 (-2.08)	-.722 (-2.00)
FSE			1.368 (2.92)	.888 (2.85)	.952 (2.58)
MID			-10.310 (-4.24)	-5.858 (-3.54)	-4.746 (-2.22)
MSEC				-.774 (-.89)	-.087 (-.09)
FSEC				-3.29 (-3.77)	-3.542 (-3.70)
LAAM					.328 (1.28)
ASIA					.531 (1.70)
AFR					.528 (1.77)
nobs	62	62	62	58	58
R^2	.28	.33	.73	.88	.89

2SLS. t-statistics in parentheses. See the Appendix for definition of variables.

Table 13: **School enrollment ratios.**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
dep. var.	*GR*, IV	*GR*, OLS	*FSEC*	*GR*, IV	*GR*, OLS	*MSEC*	*FSEC*	*FSEC*
constant	.002 (.26)	.012 (1.99)	-.212 (-1.61)	-.009 (-1.03)	.007 (1.05)	-.195 (-1.26)	-.188 (-1.19)	.966 (4.73)
GDP	-.013 (-4.68)	-.007 (-4.71)	.088 (5.86)	-.010 (-4.76)	-.006 (-4.05)	.064 (3.61)	.070 (4.80)	.024 (1.73)
PPPI	.003 (.37)	.001 (.08)		.006 (.74)	.002 (.25)			
FSEC	.111 (5.24)	.065 (6.28)						
MSEC				.106 (5.57)	.058 (6.17)			
MSE			.235 (2.95)			.203 (2.17)	.098 (1.15)	-.043 (-.60)
FSE			-.155 (-1.80)			-.127 (-1.26)	-.035 (-.40)	.101 (1.38)
MID			1.078 (2.51)			1.354 (2.69)	1.289 (2.89)	-.203 (-.48)
LAAM							.025 (.50)	.032 (.68)
ASIA							.055 (.79)	.080 (1.33)
AFR							-.181 (-3.16)	-.040 (-.70)
FERT								-.135 (-6.81)
nobs	62	62	62	62	62	62	62	62
R^2	.15	.37	.72	.32	.37	.60	.77	.77

2SLS. t-statistics in parentheses. See the Appendix for definition of variables.

Table 14: **School enrollment and fertility, rich and poor countries.**

	(1)	(2)	(3)	(4)	(5)	(6)
dep. var.	*FSEC*	*FSEC*	*FSEC*	*FERT*	*FERT*	*FERT*
sample	all	rich	poor	all	rich	poor
MID	.292 (.54)	3.119 (6.14)	.680 (1.55)	-7.162 (-2.44)	-18.698 (-5.14)	-9.425 (-4.55)
$MID * RICH$	1.899 (2.12)			-7.204 (-1.38)		
RICH	-.050 (-1.71)			1.704 (.97)		
nobs	62	29	33	62	29	33
R^2	.74	.75	.68	.75	.29	.74

t-statistics in parentheses. The first three columns report the estimated coefficient of *MID*, $MID * RICH$ and *RICH* (the latter two only for the whole sample) in a regression like (3) in Table 13, over the three different samples indicated at the top of the columns. The last three columns do the same for a regression like (3) in Table 12. See the Appendix for definition of variables.

Data Appendix

This Appendix describes the data with their sources.

GR: average yearly growth rate of per capita GDP, 1960-85 (Barro-Lee (1994), henceforth: B-L).
MID: share in income of the third and fourth quintiles, in or around 1960 (Perotti (1994b)).
PTMID: share in income of the third quintile, in or around 1960 (Persson and Tabellini (1994)).
GDP: per capita GDP in 1960 (B-L).
MSE: average years of secondary schooling of the male population, 1960 (B-L).
FSE: average years of secondary schooling of the female population, 1960 (B-L).
PPPI: PPP value of the investment deflator, relative to the U.S., 1960 (B-L).
SS: average share of government expenditure on social security and welfare in GDP, 1970-85 (Barro-Wolf (1991)).
HH: average share of government expenditure on health and housing in GDP, 1970-88 (Easterly-Rebelo (1993), henceforth: E-R).
ED: average share of government expenditure on education in GDP, 1970-88 (E-R).
MTAX: average marginal tax rate between 1970 and 1985, computed by Kormendi and Koster (1989) (E-R).
LTAX: average share of labor taxation in GDP, 1970-88 (E-R).
PTAX: average share of income taxes in personal income, 1970-88 (E-R).
URB: urbanization rate in 1965 (World Bank).
*POP*65: share of population over 65 years of age, average of 70, 75 and 85 values (B-L).
MSEC: male secondary school enrollment ratio, average of 1965 and 1985 values (B-L).
FSEC: female secondary school enrollment ratio, average of 1965 and 1985 values (B-L).
FERT: net fertility rate (constructed as total fertility rate * (1 - infant mortality rate in the first year of life)), average of 1965 and 1985 values (B-L).
LIFEEX: life expectancy at birth in 1960 (B-L).
HOMOG: percentage of the population belonging to the main ethnic or linguistic group (Canning ands Fay (1993)).
SPI: index of socio-political instability, constructed as discussed in section 6.
SPIG: index of socio-political instability, from Gupta (1990).
DEM: democracy dummy variable, assigning a value of 1 to countries with an average value over 1960 to 1985 of the democracy index in Jodice and Taylor (1988) larger than .5.
PTDEM: democracy dummy variable, from Persson and Tabellini (1994).
GDEM: democracy dummy variable, assigning a value of 1 to countries with a value of the Gastil index of political rights lower than or equal to 3 (B-L).

$RICH$ dummy variable for countries with valuesof GDP higher than \$1,500.
AFR: dummy variable for Sub-Saharan countries (B-L).
$ASIA$: dummy variable for South-Asian countries (B-L).
$LAAM$: dummy variable for Latin American countries (B-L).

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