

# Income distribution, political instability, and investment

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## Abstract

This paper successfully tests on a sample of 71 countries for the period 1960–85 the following hypotheses. Income inequality, by fuelling social discontent, increases socio-political instability. The latter, by creating uncertainty in the politico-economic environment, reduces investment. As a consequence, income inequality and investment are inversely related. Since investment is a primary engine of growth, this paper identifies a channel for an inverse relationship between income inequality and growth.

We measure socio-political instability with indices which capture the occurrence of more or less violent phenomena of political unrest and we test our hypotheses by estimating a two-equation model in which the endogenous variables are investment and an index of socio-political instability.

Our results are robust to sensitivity analysis on the specification of the model and the measure of political instability, and are unchanged when the model is estimated using robust regression techniques.

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## 1. Introduction

This paper studies the effects of income distribution on investment, by focusing on political instability as the channel which links these two variables. Income inequality increases social discontent and fuels social unrest. The latter, by increasing the probability of coups, revolutions, mass violence or, more generally, by increasing policy uncertainty and threatening property rights, has a negative effect on investment and, as a consequence, reduces growth.

Several authors have recently argued that income inequality is harmful for growth: in more unequal societies, the demand for fiscal redistribution financed by distortionary taxation is higher, causing a lower rate of growth.<sup>1</sup> Alesina and Rodrik (1993), Alesina and Rodrik (1994) and Persson and Tabellini (1994) present reduced form regressions supportive of this hypothesis.

An important question, still unresolved empirically, is what exactly is the channel through which inequality harms investment and growth. Perotti (1996) explicitly investigates the fiscal channel described above, with, however, rather inconclusive results.

In this paper we emphasize and test a different link from income inequality to capital accumulation: political instability. Therefore, our paper is related to the research on the effects of political instability on growth. For instance, Barro (1991), Alesina et al. (1996), and Mauro (1993) find an inverse relationship between political instability and growth or investment, using different techniques, approaches and data.<sup>2</sup> Venieris and Gupta (1986) identify an inverse relationship between political instability and the savings rate.

We estimate on a cross-section of 71 countries for the period 1960–85 a two-equation system in which the endogenous variables are investment in physical capital and a measure of political instability.<sup>3</sup> In our model, economic and political variables are jointly endogenous, an issue that has been generally ignored in the recent literature on the political economy of growth.<sup>4</sup> We are specifically interested in two questions:

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<sup>1</sup> A non-exhaustive list of papers in this area includes Alesina and Rodrik (1993), Alesina and Rodrik (1994), Persson and Tabellini (1994), Bertola (1993) and Perotti (1993).

<sup>2</sup> Londegran and Poole (1990), and Londegran and Poole (1991) in related work do not seem to find such evidence. For a discussion of their results and comparisons with other literature see Alesina et al. (1996).

<sup>3</sup> The number of countries used in different specifications and different tests may vary slightly because of data availability. We have always chosen the largest sample of countries for which data were available.

<sup>4</sup> Some exceptions are Londegran and Poole (1990), Londegran and Poole (1991), and Alesina et al. (1996).

1. Does income inequality increase political instability?
2. Does political instability reduce investment?

According to our findings, the answer to both questions is 'yes'. First, more unequal societies are more politically unstable: in particular, our results suggest that political stability is enhanced by the presence of a wealthy middle class. Second, political instability has an adverse effect on investment and, therefore, on growth. Furthermore, these two effects (from inequality to instability, and from instability to investment) are not only statistically significant, but also economically significant.

We also test whether income distribution influences investment directly, in addition to the channel via political instability. Several arguments would imply such a direct link. The first is a 'Kaldorian' view (Kaldor, 1956) which holds that more inequality favors more accumulation, because the rich save more than the poor. As mentioned above, a second view is based on the effects of inequality on the demand for fiscal redistribution: this argument would imply an inverse relation between inequality and investment in physical capital (Alesina and Rodrik, 1994; Bertola, 1993; Persson and Tabellini, 1994). These two effects go in opposite directions and, in principle, they may cancel out. In fact, in our sample income distribution has little additional effect on investment after controlling for political instability.

This paper is organized as follows. Section 2 discusses problems of definition and measurement of political instability, and presents our index. Section 3 describes our data. Section 4 describes the specification of our two-equation system and discusses various identification issues. In Section 5 we present our main results. Section 6 discusses several tests of sensitivity of our specification and the robustness of our results. The last section concludes.

## **2. Definition and measure of political instability**

Social and political instability are variables that are hard to define and measure in a way which can be used for econometric work. Political instability can be viewed in two ways. The first one emphasizes executive instability. The second one is based upon indicators of social unrest and political violence.

The first approach defines political instability as the 'propensity to observe government changes'. These changes can be 'constitutional', i.e. take place within the law, or 'unconstitutional', i.e. they can be coups d'état. The basic idea is that a high propensity to executive changes is associated with policy uncertainty and, in some cases, with threats to property rights. Note that the 'propensity' to executive changes is distinct from the actual frequency of changes, and can be measured by probit regressions in which the probability of a change in the executive is related to several economic, socio-political and institutional variables.

For example Cukierman et al. (1992) and Edwards and Tabellini (1991) adopt this definition of instability in their work on inflation. One important issue, however, which these authors do not completely address is that of ‘joint endogeneity’. On one hand, political instability affects aggregate economic outcome. On the other hand, the latter influences executive instability. Londegran and Poole (1990), Londegran and Poole (1991), and Alesina et al. (1996) have explicitly taken into account this problem in their work on executive instability and economic growth. All these authors estimate two-equations systems: one equation is a probit regression, which estimates the propensity to government changes, while the other is a regression for economic growth.

The second approach to measuring political instability does not focus directly on executive changes. Socio-political instability is measured by constructing an index which summarizes various variables capturing phenomena of social unrest. An important reference on this point is Hibbs (1973), who uses the method of principal components to construct such index. More recently, Venieris and Gupta (1986), Venieris and Sperling (1989), Gupta (1990), Barro (1991), Ozler and Tabellini (1991), Benhabib and Spiegel (1992) and Mauro (1993) have used several indices of socio-political instability as an explanatory variable in various regressions in which the dependent variable is growth, savings or investment. As emphasized above, joint endogeneity issues are crucial: in many cases there are good reasons to believe that the left hand side variable that one is attempting to explain as a function of socio-political instability (such as inflation, growth, investment etc.) is itself a determinant of social unrest.<sup>5</sup>

Which of the two approaches to measuring political instability described above is preferable is not clear a priori and may depend upon the specific issue under consideration. For instance, one may argue that, for a *given level of expected government turnover*, phenomena of social unrest do not have any direct impact on policy uncertainty, and therefore on economic decisions. This might be a strong but useful ‘identifying’ assumption: policy changes relevant for economic decisions can occur only when governments change. On the other hand, one may argue that, particularly when it reaches very high levels, social unrest disrupts market activities and might affect investment for reasons different than the uncertainty associated with high expected government turnover. In fact, mass violence, civil wars, political disorder and physical threats to workers and entrepreneurs engaged in productive activities can have direct effects on productivity and therefore on the rate of return to investment. In addition, high levels of social and political unrest – including a high frequency of coups and of episodes of violence on politicians – might drastically shorten the horizon of politicians. With a short expected tenure in office, the reputation mechanisms that ordinarily prevent the taxation of fixed

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<sup>5</sup> Hibbs (1973) and Gupta (1990) do take this problem into account in their work.

Table 1

Definition of variables and data sources. This Table describes the data used in the regressions. All the data are from the Barro and Wolf (1989) data set, except for the income distribution data which are mainly from Jain (1975) (see Perotti (1996) for a more detailed list of the original sources) or unless otherwise indicated

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<i>GDP</i> :	GDP in 1960 in hundreds of 1980 dollars;
<i>PRIM</i> :	Primary school enrollment rate in 1960, from Barro and Lee (1993);
<i>SEC</i> :	Secondary school enrollment rate in 1960, from Barro and Lee (1993);
<i>MIDCLASS</i> :	Share of the third and fourth quintiles of the population in or around 1960;
<i>INV</i> :	Ratio of real domestic investment (private plus public) to real GDP (average from 1960 to 1985);
<i>PPPI</i> :	PPP value of the investment deflator (U.S. = 1.0), 1960;
<i>PPPIDE</i> :	Magnitude of the deviation of the PPP value for the investment deflator from the sample mean, 1960;
<i>SPI</i> :	Index of socio-political instability, constructed using averages over 1960–85 of the variables that appear in the formula of Eq. 1;
<i>SPIG</i> :	Index of socio-political instability, constructed using annual data from the formula in Gupta (1990), average over 1960–85;
<i>HOMOG</i> :	Percentage of the population belonging to the main ethnic or linguistic group, 1960, from Canning and Fay (1993);
<i>URB</i> :	Urban population as percentage of total population in 1960. Source: World Bank Tables;
<i>GOV</i> :	Government consumption as share of GDP, average 1970–85;
<i>DEATH</i> :	Average number of deaths in domestic disturbances, per millions population, 1960–85, from Jodice and Taylor (1988);
<i>ASSASS</i> :	Average number of assassinations, 1960–85, from Jodice and Taylor (1988);
<i>UCOUP</i> :	Average number of unsuccessful coups, 1960–85, from Jodice and Taylor (1988);
<i>SCOUP</i> :	Average number of successful coups, 1960–85, from Jodice and Taylor (1988);
<i>DEM</i> :	Dummy variable taking the value 1 for democracies, 0.5 for semi-democracies, and 0 for dictatorships, average 1960–85, from Jodice and Taylor (1988).

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factors, and capital in particular, are less likely to be operative. The higher expected taxation of capital therefore might discourage investment.<sup>6</sup>

This paper adopts the second approach to measuring political instability. We explicitly take into account problems of joint endogeneity by estimating a system of two equations in which the two endogenous variables are investment and an index of socio-political instability, *SPI*. The index is constructed by applying the method of principal component to the following variables: *ASSASS*, the number of politically motivated assassinations; *DEATH*, the number of people killed in

<sup>6</sup> Note that this effects of social unrest on the expected level of taxation might be less strong in the case of *legal* executive turnover emphasized in the first notion of instability, because in this latter case a policymaker ousted from power can still regain power with positive probability.

conjunction with phenomena of domestic mass violence, as a fraction of the total population; *SCOUP*, the number of successful coups; *UCOUP*, the number of attempted but unsuccessful coups; *DEM*, a dummy variable that takes the value of 1 in democracies, 0.5 in ‘semi-democracies’ and 0 in dictatorships. A ‘democracy’ is defined as a country with free competitive elections; a semi-democracy is a country with some form of elections but with severe restrictions on political rights (for instance, Mexico); a dictatorship is a country without competitive elections.<sup>7</sup> All the variables are expressed as the average of annual values over the sample period, 1960–85. A more detailed definition of the variables used in this paper, including sources, is in Table 1.

In choosing these variables to include in the index, we want to capture the idea of political instability viewed as a threat to property rights. Therefore we include two variables (*ASSASS* and *DEATH*) which capture phenomena of mass violence as well as violent and illegal forms of political expressions. Conceptually, it is not clear which measure is more appropriate. However, one can reasonably argue that a relatively rare event such as the assassination of a prominent politician – like a prime minister – is just as disruptive of the social and political climate of a small country as of a large country. Thus, this variable should be measured in absolute, not per capita, terms. Conversely, the significance of a given number of deaths in a domestic disturbance or a civil war clearly depends on the size of the population. Thus, the number of deaths should be measured in per capita, not in absolute, terms. This is the approach we take in constructing our index: throughout the paper, *ASSASS* is measured in absolute terms while *DEATH* is the number of deaths per million population. However, we also experimented with all the alternative combinations of definitions of these two variables, and the results did not change appreciably. Thus, our index does not appear to be unduly sensitive to the way we measure the variables *ASSASS* and *DEATH*. Our index also includes two variables (*SCOUP* and *UCOUP*) which capture illegal and typically violent transfers of executive power, successful or attempted. The variable *DEM* is included in the *SPI* index mainly because of reporting problems: in most dictatorships the government controls the press and restricts the diffusion of information, particularly abroad. Thus, measures of socio-political unrest are likely to be under-reported, for propaganda reasons, in dictatorships.

The inclusion of *DEM* in our *SPI* index is also advisable for a second conceptual reason. Dictatorships are much more prone to be overthrown by extremists than stable democracies. That is, for the same level of observed political violence, the likelihood of a violent overthrow of the government with a breakdown of legality is higher in a dictatorship.

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<sup>7</sup> This variable is obtained from Alesina et al. (1996).

Applying the method of principal components<sup>8</sup> to the five variables listed above leads to the following index of socio-political instability:

$$SPI = 1.39 \text{ ASSASS} + 1.21 \text{ DEATH} + 7.58 \text{ SCOUP} + 7.23 \text{ UCOUP} \\ - 5.45 \text{ DEM.} \quad (1)$$

Note that, in constructing our index, we first standardized all variables appearing in it; therefore, the orders of magnitude of the effects of each variable are comparable. Our *SPI* index is related, but far from identical, to indices recently proposed by Venieris and Gupta (1986) and Gupta (1990), which we used in previous versions of this paper, and is somewhat different from the Hibbs (1973) index. Section 6 discusses the robustness of our results to the use of these alternative indices and to small changes in the specification of our index.

### 3. Data and sample period

We perform cross-sectional regressions using a sample of 71 countries for the period 1960–1985. The binding constraint on the number of countries is the data availability. We have income distribution data for 74 countries, but for only 71 of these we have data on political instability and the other variables we use in our regressions, like investment shares in 1960–85 and GDP per capita in 1960.

We use the same dataset on income distribution assembled by Perotti (1996). The income distribution data consist of the income shares of the five quintiles of the population, measured as close as possible to the beginning of each sample period, 1960. In our framework, income distribution is predetermined; therefore, it is appropriate to measure this variable at the beginning of the sample period. In

<sup>8</sup> The method of principal components is used to describe a set of variables with a set of variables of lower dimensionality. This method locates  $n$  linear combinations ('principal components') of the  $n$  columns of the  $X'X$  matrix, all orthogonal to each other, with the following property: the first principal component  $p_1$  minimizes  $tr(X - p_1 a_1)'(X - p_1 a_1)$ , where  $a_1$  is the eigenvector of the  $X'X$  matrix associated with the largest eigenvalue. Intuitively,  $p_1$  summarizes the  $n$  variables in  $X$  by giving the best linear description of the columns of  $X$  in a least squares sense. The second principal component of  $p_2$  also describes what is not 'captured' by the first component  $p_1$  by minimizing the sum of squared residuals after subtracting  $p_1$ , i.e.  $p_2$  minimizes  $tr(X - p_1 a_1 - p_2 a_2)'(X - p_1 a_1 - p_2 a_2)$  where  $a_2$  is now the eigenvector associated with the second largest eigenvalue, and so on. We use the first principal component of the five variables listed in the text as our *SPI* index. One can measure the contribution of the first principal component to explaining the total variability of the original variables, which is captured by the expression  $trX'X$ . It can be shown that the contribution of the first principal component to the reduction of this variability is  $trX'X - \lambda_1$ , where  $\lambda_1$  is the highest eigenvalue. Because we standardize all our variables, the variance explained by the first principal component is generally quite low, between 0.3 and 0.4. If we had not standardized our variables, the first principal component would have been practically identical to the variable with the highest order of magnitude, in our case *DEATH*. See Theil (1971, Ch. 1), for a brief description of the method of principal components.

fact, in the long run income distribution is likely to be endogenous, as it is arguably affected by such factors as land reforms, the savings behavior of the population etc. These problems of endogeneity are clearly hard to overcome: however, measuring income distribution at the beginning of the sample period is a way of minimizing them.

Data on quintiles shares in existing datasets on income distribution derive from surveys conducted at different times, and differ in terms of their coverage (nationwide, urban, etc.), of the definition of income (pre-tax, pre-transfers, etc.), and of the definition of recipient unit (by households, by economically active persons, by individuals, etc.). In principle, all data refer to pre-tax income, while transfers are generally (but not always) included in data organized by households but not in data by economically active persons or individuals. However, in the surveys the actual definition of income used by the respondent is very difficult to control, particularly in developing countries. Since income distribution data generally come from expenditure surveys, it is likely that in most cases transfers are included in the responses used to construct the income shares.

The majority of countries in our sample have data by households with nationwide coverage. For the remaining countries, observations organized by economically active persons and by individuals have to be used. However, there are good reasons to believe that these two types of data systematically understate the share of incomes of the third and fourth quintiles of the distribution, relative to data organized by households. In order to make data by economically active persons comparable to those by households, Perotti (1996) used the following procedure. For some countries, data are available on both the distribution by households and by economically active persons in the same year and with the same coverage. Using these countries, one can estimate by what factor, *on average*, the shares of the third and fourth quintiles in the distributions by economically active persons underestimate those by households. Multiplying the observations by economically active persons by this factor, one can make them comparable to the observations by households. One can therefore use the former type of data when the latter is not available. A similar procedure can be followed for data organized by individuals and for data with less than nationwide coverage – note, however, that only 6 countries out of 71 in our sample have less than nationwide coverage. Thus, following this procedure, one can construct a dataset in which other types of income distribution data can be made more consistent with data by households and with nationwide coverage.<sup>9</sup> As mentioned above, no readily available adjustment is possible for discrepancies in the definition of the income concept among surveys, whether it is pre- or post-tax or transfers.

The binding constraint on the initial date of the sample period is the availability

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<sup>9</sup> Note, however, that our results would not change if data by economically active persons, by individuals and with less than nationwide coverage were *not* adjusted as described above.

Table 2  
SPI index (sample 1960–85)

Country	SPI	Country	SPI
Tanzania	-0.73	Panama	5.42
Malawi	-2.66	Brazil	-0.19
Sierra Leone	9.11	Colombia	-4.69
Niger	3.42	Jamaica	-11.60
Burma	1.58	Greece	2.41
Togo	6.80	Costarica	-11.76
Bangladesh	8.39	Cyprus	-5.55
Kenia	-0.72	Peru	7.46
Botsawana	-9.68	Barbados	-11.76
Egypt	1.83	Iran	-1.13
Chad	7.61	Mexico	-4.15
India	-8.92	Japan	-11.68
Morocco	2.41	Spain	-2.77
Nigeria	12.69	Iraq	30.64
Pakistan	9.11	Ireland	-11.37
Congo	21.66	South Africa	-7.08
Benin	30.34	Israel	-11.67
Zimbabwe	-1.76	Chile	0.50
Madagascar	2.42	Argentina	30.54
Sudan	15.09	Italy	-8.10
Thailand	9.31	Uruguay	4.80
Zambia	-3.46	Austria	-11.68
Ivory Coast	-2.74	Finland	-11.76
Honduras	5.00	France	-9.44
Senegal	-0.98	Holland	-11.68
Gabon	4.05	U.K.	-7.63
Tunisia	-2.57	Norway	-11.76
Philippines	-4.14	Sweden	-11.68
Bolivia	44.19	Australia	-11.68
Dom. Republic	8.22	Germany	-11.45
Sri Lanka	-9.91	Venezuela	4.03
El Salvador	7.94	Denmark	-11.76
Malaysia	-11.21	New Zealand	-11.76
Ecuador	19.91	Canada	-11.68
Turkey	2.88	Switzerland	-11.76
		U.S.A.	-11.06

of economic data. Our main sources for this variable is the Barro–Wolf and the Barro–Lee datasets, with the exceptions noted in Table 1. The end of our sample period (1985) is imposed by the availability of economic and socio-political variables. The list of these variables with their sources is included in Table 1, as well.

Table 2 reports the average of our *SPI* index for the sample 1960–85, ordered from the poorest to the richest country, in terms of their per capita income in 1960. This ordering immediately highlights a positive correlation between poverty and

Table 3  
Summary statistics (sample 1960–85)<sup>a</sup>

	Nobs	Mean	Std. Err.	Min.	Max.
<i>INV</i>	71	19.64	7.49	6.82	36.91
<i>SPI</i>	71	0.00	11.95	-11.76	44.19
<i>SPIG</i>	69	18.40	5.04	11.41	28.17
<i>GDP</i>	71	20.81	18.77	2.08	73.80
<i>PRIM</i>	71	76.11	27.60	5.00	100.00
<i>SEC</i>	71	24.85	22.34	0.40	86.00
<i>MIDCLASS</i>	71	33.62	5.66	20.10	42.03
<i>PPPI</i>	71	70.25	24.74	26.00	161.10
<i>PPPIDE</i>	71	19.74	15.42	0.03	86.30
<i>HOMOG</i>	67	58.89	29.53	7.00	99.00
<i>ASSASS</i>	71	0.30	0.54	0	2.91
<i>DEATH</i>	71	30.33	192.29	0	1619.72
<i>SCOUP</i>	71	0.06	0.09	0	0.39
<i>UCOUP</i>	71	0.08	0.13	0	1
<i>DEM</i>	71	0.50	0.42	0	1

<sup>a</sup> For definitions of variables and sources, see Table 1. Values for *ASSASS*, *DEATH*, *SCOUP*, *UCOUP* and *DEM* are before standardization.

socio-political instability. Furthermore, a few countries suggest interesting observations. Japan has a much lower index of instability than countries at comparable level of development in 1960. Thirty years later this country is one of the richest in the world. The opposite observation holds for Argentina: it has the second highest *SPI* index and from 1960 to 1985 it has dropped several steps in the income ladder. Not surprisingly, the most stable countries are OECD democracies, even though several LDCs, such as Botswana, are also relatively stable. The case of Venezuela is also interesting: in 1960 it had the fifth highest per capita income in the sample, but a much higher *SPI* index than the countries in the same group.

Table 3 reports the summary statistics for our variables and Table 4 highlights simple correlations between them. The two key correlations for our purposes are those between *SPI* and investment, *INV*, and between *SPI* and *MIDCLASS*, which represents the share of total income of the third and fourth quintiles of the population.

The two correlations are  $-0.42$  and  $-0.47$ , respectively. These signs are consistent with our hypothesis, namely that socio-political instability depresses investment and income inequality makes the socio-political environment more unstable. Also, *SPI* is negatively correlated with both the level of income and the level of education. However, the latter two variables are highly correlated with each other. Note that *MIDCLASS* has a much higher correlation with secondary school enrolment than with primary school enrolment. This correlation suggests, perhaps, that if the middle class is sufficiently well off, they can obtain for their children a level of education beyond the primary one. Because of this correlation,

Table 4  
Correlation matrix (sample 1960–85)

	<i>INV</i>	<i>SPI</i>	<i>SPIG</i>	<i>GDP</i>	<i>PRIM</i>	<i>SEC</i>	<i>MIDCL.</i>	<i>PPPI</i>	<i>PPPIDE</i>
<i>INV</i>		-0.42	-0.55	0.49	0.59	0.57	-0.37	-0.31	-0.22
<i>SPI</i>			0.83	-0.44	-0.42	-0.55	-0.47	-0.14	0.20
<i>SPIG</i>				-0.62	-0.59	-0.67	-0.54	-0.12	-0.15
<i>GDP</i>					0.62	0.81	0.59	0.11	-0.08
<i>PRIM</i>						0.66	0.31	-0.00	-0.15
<i>SEC</i>							0.66	0.08	-0.25
<i>MIDCL.</i>								-0.06	-0.34
<i>PPPI</i>									.26
	<i>AFRICA</i>	<i>ASIA</i>	<i>LAAM</i>	<i>ASSASS</i>	<i>DEATH</i>	<i>SCOUP</i>	<i>UCOUP</i>	<i>DEM</i>	<i>HOMOG</i>
<i>INV</i>	-0.26	-0.02	-0.11	0.00	-0.12	-0.27	-0.25	-0.57	0.31
<i>SPI</i>	0.22	-0.04	0.25	0.17	0.14	0.91	0.86	-0.65	-0.26
<i>SPIG</i>	0.35	0.00	0.11	0.32	0.21	0.66	0.51	-0.88	-0.47
<i>GDP</i>	-0.46	-0.13	-0.06	0.09	-0.12	-0.32	-0.17	0.71	0.38
<i>PRIM</i>	-0.65	0.12	0.26	0.08	-0.18	-0.23	-0.21	0.69	0.62
<i>SEC</i>	-0.55	-0.05	-0.14	0.06	-0.13	-0.37	-0.31	0.78	0.13
<i>MIDCLASS</i>	-0.31	-0.14	-0.31	0.05	-0.18	-0.31	-0.35	0.56	0.26
<i>PPPI</i>	0.00	-0.02	-0.07	-0.17	0.12	-0.29	-0.05	-0.04	0.16
<i>PPPIDE</i>	-0.07	0.11	0.16	0.06	0.04	0.02	0.32	-0.14	-0.14
<i>AFRICA</i>		-0.13	-0.34	-0.23	0.19	0.06	0.05	-0.57	-0.61
<i>ASIA</i>			-0.12	-0.01	-0.03	-0.01	-0.08	-0.01	-0.18
<i>LAAM</i>				0.06	-0.07	0.31	0.29	0.02	0.34
<i>ASSASS</i>					0.01	0.09	0.13	0.04	0.02
<i>DEATH</i>						0.05	0.02	-0.12	-0.21
<i>SCOUP</i>							0.74	-0.43	-0.13
<i>UCOUP</i>								-0.32	-0.11
<i>DEM</i>									0.47

<sup>a</sup> For definitions of variables and sources, see Table 1.

and because our sample includes several LDCs in which enrolment ratios in secondary schools in 1960 were extremely small, we prefer to use primary school enrollment as our measure of education. Finally, in our sample *MIDCLASS* has a correlation of  $-0.93$  with the share of the richest quintile (not shown). This implies that an increase in the share of the middle class is associated, on average, with essentially a one for one decrease in the share of the richest quintile. This is the main reason why the two variables do not appear at the same time in our regressions.

Also, Table 4 reports the correlations of our index with its components. Using these correlations with the coefficients of the *SPI* index displayed in Eq. (1), one can form an idea of the importance of each component in our results. We discuss this topic extensively in Section 6.

#### 4. Model specification

Our hypothesis is that income inequality increases socio-political instability and the latter reduces the propensity to invest. A large group of impoverished citizens, facing a small and very rich group of well-off individuals is likely to become dissatisfied with the existing socio-economic status quo and demand radical changes, so that mass violence and illegal seizure of power are more likely than when income distribution is more equitable. Several arguments justify the second link, from political instability to investment. Broadly speaking, political instability affects investment through three main channels. First, because it increases the expected *level* of taxation of factors that can be accumulated, through the mechanism noted in Section 2. Second, because phenomena of social unrest can cause disruption of productive activities, and therefore a fall in the productivity of labor and capital. Third, because socio-political instability increases *uncertainty*, thereby inducing investors to postpone projects, invest abroad (capital flights) or simply consume more. In turn, a high value of the *SPI* index implies high uncertainty for two reasons. First, when social unrest is widespread, the probability of the government being overthrown is higher, making the course of future economic policy and even protection of property rights more uncertain. Second, the occurrence of attempted or successful coups indicates a propensity to abandon the rule of law and therefore, in principle, a threat to established property rights.

We capture these two links in a simple bivariate simultaneous equation model with *SPI* and investment as endogenous variables. The most basic specification of this model is as follows:

$$INV = \alpha_0 + \alpha_1 SPI + \alpha_2 GDP + \alpha_3 PPPIDE + \alpha_4 PPPI + \epsilon_1, \quad (2)$$

$$SPI = \beta_0 + \beta_1 PRIM + \beta_2 INV + \beta_3 MIDCLASS + \epsilon_2. \quad (3)$$

In specifying this system, we encounter a problem common to all the recent empirical growth literature: very few variables on the r.h.s. can be regarded as truly exogenous over our sample period. Our strategy in testing our theory has two steps. First, we choose the basic specification of Eqs. (2) and (3) following standard specifications in the recent empirical growth literature, keeping in mind the need to identify the system through reasonable exclusion restrictions. In fact, note that our specification leads to a reduced form that is very similar to the investment equation in Barro (1991): the three critical points of departure from that regressions are that we measure political instability differently, endogenize the *SPI* index and introduce an income distribution variable. Second, because we recognize that our basic specification is only one among several reasonable alternatives, in Section 6 we subject it to an extensive sensitivity and robustness analysis, by adding exogenous variables, changing our identifying exclusion restrictions, etc.

As discussed above, we expect  $\alpha_1$  in the investment equation to be negative. In

the same equation, we control for the initial level of GDP per capita, as it is common in the literature. Note that the sign of the coefficient of *GDP*,  $\alpha_2$ , is a priori ambiguous: according to the exogenous growth theory, long-run convergence would imply a negative sign. However, as Levine and Renelt (1992) have shown, empirically *GDP* enters with a consistently positive sign in cross-country investment regressions, suggesting that the convergence in GDP per capita occurs through channels different from increases in physical investment. The two variables *PPPI* (the PPP value of the investment deflator in 1960 relative to that of the U.S.) and *PPPID* (the magnitude of the deviation of *PPPI* from the sample mean) capture the effects of domestic distortions which obviously would affect investment directly.

Turning to the *SPI* equation, we included the variable *PRIM* (the enrollment ratio in primary school in 1960) as a proxy for human capital, on the ground that a higher level of education may reduce political violence and channel political action within institutional rules (see Huntington (1968) or Hibbs (1973)).<sup>10</sup> Therefore, we expect  $\beta_1$  to be negative. Investment is also included to test whether rapidly growing economies tend to be more stable: on the one hand, more growth means more prosperity, less dissatisfaction and possibly more stability, implying a negative sign for  $\beta_2$ . On the other hand, periods of very high growth may temporarily lead to social disruptions and economic transformation which may actually increase political instability. Finally, as discussed at length above, we expect a positive relation between inequality and instability: accordingly, under the null hypothesis the sign of  $\beta_3$  should be negative when an index of equality is used.

There are three crucial identifying assumptions in our system. First, we exclude *PPPID* and *PPPI* from the *SPI* equation. We feel these are reasonable restrictions: these variables measure market distortions and the relative price of investment goods, both of which should have a direct effect on investment decisions and a much less clear-cut effect of social unrest. Second, we exclude *PRIM* from the investment equation. This restriction is certainly less natural than the previous one: therefore, later we present regressions with our proxy for human capital included in the investment equation, and show that the results are virtually unaffected. Third, initial GDP per capita is excluded from the *SPI* equation. This restriction too could be subject to criticism: thus, in this case too we present regressions showing that the inclusion of this variable does not alter our results. Sensitivity analysis on these and other identifying assumptions are presented below in Section

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<sup>10</sup> In addition to providing new measures of primary enrollment, Barro and Lee (1993) have recently estimated several stock measures of human capital, and they kindly made all their data available to us. We prefer to use their primary enrollment ratio which is not an estimate but a direct observation. When we use their estimated human capital stock our regressions are less successful, possibly because of measurement errors in the constructed stock variables.

6: our basic results are quite robust to changes in the specification of the system.<sup>11</sup>

We have also built upon this basic specification by adding other exogenous variables. We added in the *SPI* equation a variable that captures the degree of linguistic and ethnic fragmentation, on the ground that more homogeneous societies are likely to exhibit, *ceteris paribus*, less socio-political instability. We also included a variable for urbanization in the *SPI* equation: several political scientists (for instance, Huntington (1968) and Hibbs (1973)) have argued that more urbanized societies should be more politically unstable because political participation and social unrest are more likely to be higher in cities. Finally, one could argue that income distribution can affect investment directly, not only through political instability, but also through two additional channels. The first one is a 'Kaldorian' saving function. According to Kaldor (1956), the 'capitalists' save more in proportion to their income than the 'workers'. Testing this hypothesis would require data on the functional distribution on income, which is not available for most countries in our sample. However, since income from capital is typically concentrated in the top quintile of the population, there is a strong correlation between functional distribution of income and the share of income of the top quintile or of the middle class. Thus, the 'Kaldorian' hypothesis could be expressed as a negative relationship between the share of the middle class and the saving rate and therefore investment, after controlling for the effects of income distribution on investment through its effects on socio-political instability. On the other hand, Alesina and Rodrik (1994) and Bertola (1993) argue that the more unequal the distribution of income, the higher is the demand for fiscal redistribution through taxation of capital. The latter may depress investment by increasing the tax burden on investors. In order to explore these direct channel we have run a second specification, in which we added an income distribution variable in the investment equation. However, since the two channels discussed above go in opposite direction, the sign of the associated coefficient is *a priori* ambiguous.

Finally, note that the dependent variable in Eq. (2) is total investment (*INV*). We use total rather than private investment because the breakdown of investment

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<sup>11</sup> Our paper is somewhat related to recent work by Gupta (1990). Like us, Gupta estimates a structural model where income distribution affects political instability and the latter affects investment. Our specification, however, builds on the recent empirical literature on growth and differs substantially from Gupta's. Moreover, he has observations on income distribution for only 49 of the 104 countries in his sample. The remaining observations are obtained by regressing the existing sample of income distribution variables on a set of explanatory variables, and using the estimated coefficients to generate values for the missing observations. There is no need to underline the problems of this procedure. Finally, for reasons that are not clear to us, in all his regressions Gupta uses the 1970 value of the *SPI* index rather than its average on the estimation period as we do. These and other differences are sufficient to explain the difference in results between the two works: in fact, contrary to our results, in Gupta's book both income distribution and political instability turn out to be insignificant in explaining political instability and investment respectively.

between private and public is available only for 56 of the 71 countries of our sample and only from 1970 onward. Aside from considerations of data availability, there are reasons to believe that public investment as well as private investment should be negatively affected in periods of high socio-political instability. Since these are usually periods of high and contrasting demands on the government budget, public investment projects are likely to be reduced to make room for redistributive expenditure.

## 5. Estimation of the basic specification

We start by estimating the basic specification of Eqs. (2) and (3) in columns (1a) and (1b) of Table 5. The two key coefficients are those that capture the effects of *SPI* on *INV* and of *MIDCLASS* on *SPI*. Both coefficients have the expected signs and are significant at the 5% level: socio-political instability depresses

Table 5  
Investment and SPI equations, 1960–85<sup>a</sup>

	<i>INV</i> (1a)	<i>SPI</i> (1b)	<i>INV</i> (2a)	<i>SPI</i> (2b)
Constant	27.36 (9.34)	37.43 (4.54)	27.85 (9.49)	32.44 (3.02)
<i>GDP</i>	0.07 (1.09)		0.06 (0.91)	
<i>SPI</i>	-0.50 (-2.39)		-0.57 (-3.14)	
<i>PPPI</i>	-0.14 (-2.39)		-0.15 (-3.14)	
<i>PPPIDE</i>	0.04 (0.62)		0.05 (0.79)	
<i>PRIM</i>		-0.23 (-2.45)		-0.32 (-2.82)
<i>MIDCLASS</i>		-1.01 (-3.42)		-0.68 (-2.34)
<i>INV</i>		0.72 (1.30)		0.66 (1.38)
<i>LAAM</i>				9.89 (2.39)
<i>ASIA</i>				2.59 (0.38)
<i>AFRICA</i>				-3.17 (-0.76)
NOBS	71	71	71	71
s.e.e.	6.71	11.62	7.09	10.90

<sup>a</sup> 2SLS. *t*-statistics in parentheses. Estimates using 3SLS are very similar.

investment and a rich middle class reduces socio-political instability. A ‘healthy’ middle class is conducive to capital accumulation because it creates conditions of social stability. As noted above, the share of income of the middle class has a correlation of almost  $-1$  with the share of the richest quintile; thus, a wealthier middle class implies more equality in the distribution of income.

An increase by one standard deviation of the share of the middle class is associated with a decrease in the index of political instability by about 5.7, which corresponds to about 48% of its standard deviation. This in turn is associated with an increase in the share of investment in GDP of about 2.85 percentage points. The effect of income distribution on investment implied by these estimates is definitely not negligible, since the difference between the highest and lowest value of *MIDCLASS* in the sample is about 4 standard deviations. In addition, an exogenous increase in the *SPI* index by one standard deviation causes a decrease in the share of investment in GDP of about 6 percentage points.

The coefficient on *PPPI* in the investment equation has the expected negative sign and is significant at high levels of confidence: market distortions do have negative effects on investment. The second proxy for market distortions, *PPPIDE*, is insignificant. Consistently with the results of the existing literature, initial GDP per capita has a positive, although insignificant, coefficient.<sup>12</sup>

The estimation results for the *SPI* equation are also very sensible. *PRIM* has a negative and significant coefficient: as expected, countries with higher levels of education tend to be more stable.

In columns (2a) and (2b) we add three regional dummies, *ASIA* (for the East Asian countries), *LAAM* (for Latin American countries) and *AFRICA* (for Sub-Saharan countries), in the *SPI* equation. There are at least two reasons for this: first, cultural and/or historical reasons may influence the amount of socio-political unrest in different regions of the world. Second, in certain regions, particularly Africa, under-reporting of socio-political events can be particularly acute. Of the three regional dummies, only *LAAM* is significant: as expected, on average Latin American countries tend to be much more unstable than the other countries in the sample. The coefficient of *SPI* in the investment equation is very similar to that of column (1a), while the coefficient of *MIDCLASS* in the *SPI* equation drops (in absolute value) by about 30% to  $-0.68$ , although it remains strongly significant. This is hardly surprising, since the Latin America countries in the sample are more unstable than the average and, especially, have a particularly unequal distribution of income. Since regional dummies do appear to be important in our regressions, from now on we include them in all our reported estimates; it might be worthwhile

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<sup>12</sup> Note that our results in the investment equation are consistent with the reduced-form results in Barro (1991).

noting that, if we did not include them, in general our results on the income distribution variable would be *stronger* than the ones we report.<sup>13</sup>

## 6. Robustness and sensitivity analysis

We first tested the sensitivity of our results to the particular *SPI* index used. In a previous version of this paper we used an index proposed by Gupta (1990): this index (*SPIG*) was obtained by applying the method of discriminant analysis to a larger sample than ours (about 100 countries). In addition to the variables used in our index<sup>14</sup>, Gupta includes: *PROTEST*, the number of political demonstrations against a government; *RIOT*, the number of riots; *STRIKE*, the number of political strikes; *ATTACK*, the number of politically motivated attacks; *EXECUTION*, the number of politically motivated executions. Thus, our index differs from Gupta's for three reasons: his sample of countries is different, he uses discriminant analysis rather than the principal component method to construct it, and he includes many more variables. Despite these differences, the correlation of Gupta's index to ours is extremely high, about 0.83 (see Table 4). Table 6 reports the results obtained when using Gupta's *SPIG* index in the same systems estimated in Table 5.

Both the coefficient of the *SPIG* index in the investment equation and of *MIDCLASS* in the *SPIG* equation have the expected sign and are significant at conventional levels. Interestingly, the size of the coefficients in columns (1a) and (1b) of Table 6 are such that an increase in *MIDCLASS* by one standard deviation has similar effects on *SPIG* and, through the latter, on investment as in the corresponding regressions of columns (1a) and (1b) of Table 5, where our *SPI* index is used. All the other coefficients too exhibit patterns very similar to those of Table 5.

We have experimented by applying the principal component method to several combinations of the long list of variables included in the Gupta's index. The

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<sup>13</sup> As mentioned above, the breakdown of total investment into private and public investment is available only for 56 countries and only from 1970 onward. We estimated the same specifications of Table 5 using the average rate of private investment in the 1970–85 period with the following results: the effect of *SPI* on investment remains large and statistically significant; the coefficient of *MIDCLASS* in the *SPI* equation has the correct sign but is not significant at conventional levels. We repeated the same regressions using total investment over the same sample 1970–85: the results were essentially identical to those obtained when using private investment. These findings (available upon request) suggest that the difference between the results of Table 5 and those obtained with private investment are due to the sample size but especially to the shorter time period. A fifteen year period (1970–85) may be too short for the type of structural, long-run relationship between inequality and instability that we are testing. Therefore, we feel that it is more reasonable to place more weight on the results obtained for the 1960–85 period.

<sup>14</sup> Note however that Gupta's measure of the variable *DEM* is slightly different from ours, although the two measures are highly correlated.

Table 6  
Investment and SPIG equations, 1960–85

	<i>INV</i> (1a)	<i>SPIG</i> (1b)	<i>INV</i> (2a)	<i>SPIG</i> (2b)
Constant	49.35 (5.25)	36.59 (12.79)	53.90 (5.69)	36.09 (9.07)
<i>GDP</i>	0.02 (0.29)		-0.02 (-0.21)	
<i>SPIG</i>	-1.19 (-2.88)		-1.39 (-3.36)	
<i>PPPI</i>	-0.12 (-3.86)		-0.12 (-3.75)	
<i>PPIDE</i>	-0.01 (-0.12)		0.002 (1.03)	
<i>PRIM</i>		-0.11 (-3.26)		-0.13 (-3.75)
<i>MIDCLASS</i>		-0.38 (-3.81)		-0.32 (-3.03)
<i>INV</i>		0.14 (0.74)		0.13 (0.74)
<i>LAAM</i>				1.81 (1.18)
<i>ASIA</i>				0.92 (0.37)
<i>AFRICA</i>				-0.97 (-0.63)
NOBS	69	69	69	69
s.e.e.	5.96	3.98	6.33	3.96

<sup>a</sup> 2SLS. *t*-statistics in parentheses. Estimates using 3SLS are very similar.

pattern of results that we obtain (available upon request) can be summarized as follows. First, when we add *RIOT*, *PROTEST*, *ATTACK* or *EXECUTION* to the list of variables of our *SPI* index, the results remain largely unaffected, and in some cases are even stronger than those we have presented. The results are also largely independent of whether we use per capita or total values for the variables that can be interpreted both ways, like the number of assassinations, deaths, attacks, executions etc. Our results worsen slightly, compared to those of Table 5, with indices that do not include successful and unsuccessful coups. This finding suggests that these two variables are important to capture threats to property rights and policy uncertainty. Finally, if we leave out the variable *DEM*, our results generally worsen.

Table 7 displays several additional specifications that build upon the basic one. In this table we use our *SPI* index, but the results (available upon request) are very similar when the *SPIG* index is used. Also, because we include the regional

Table 7

Investment and SPI equations, alternative specifications, 1960–85<sup>a</sup>

	<i>INV</i> (1a)	<i>SPI</i> (1b)	<i>INV</i> (2a)	<i>SPI</i> (2b)	<i>INV</i> (3a)	<i>SPI</i> (3b)	<i>INV</i> (4a)	<i>SPI</i> (4b)
Constant	21.59 (5.70)	30.65 (2.66)	28.03 (9.61)	32.38 (2.99)	46.42 (3.93)	32.44 (3.02)	26.84 (10.03)	8.60 (0.66)
<i>GDP</i>	0.03 (0.56)	-0.04 (-0.43)	0.06 (1.06)		0.07 (0.88)		0.09 (1.55)	
<i>SPI</i>	-0.40 (-2.37)		-0.51 (-3.02)		-0.85 (-2.99)		-0.44 (-2.50)	
<i>PPPI</i>	-0.13 (-4.10)		-0.14 (-3.97)		-0.17 (-3.53)		-0.13 (-4.11)	
<i>PPPIDE</i>	0.04 (0.67)		0.03 (0.58)		0.04 (0.52)		0.03 (0.49)	
<i>PRIM</i>	0.08 (2.18)	-0.31 (-2.63)		-0.22 (-2.10)		-0.32 (-2.82)		
<i>SEC</i>								-0.37 (-2.72)
<i>MIDCLASS</i>		-0.63 (-2.02)		-0.63 (-2.15)	-0.50 (-1.65)	-0.68 (-2.34)		-0.32 (-1.00)
<i>INV</i>		0.68 (1.40)		0.42 (0.93)		0.66 (1.38)		0.56 (1.21)
<i>HOMOG</i>				-0.07 (-1.15)				
<i>LAAM</i>		9.68 (2.32)		10.73 (2.59)		9.89 (2.39)		3.68 (0.98)
<i>ASIA</i>		1.92 (0.27)		-0.98 (-0.13)		2.59 (0.38)		-4.44 (-0.66)
<i>AFRICA</i>		-3.40 (-0.80)		-3.48 (-0.80)		-3.17 (-0.76)		-2.46 (-0.58)
NOBS	71	71	67	67	71	71	71	71
s.e.e.	6.02	11.01	6.85	10.74	8.98	10.90	6.36	11.13

<sup>a</sup> 2SLS. *t*-statistics in parentheses. Estimates using 3SLS are very similar.

dummies in the *SPI* equation, the estimates that appear in these two tables should be compared to columns (2a) and (2b) of Table 5.

First, as discussed in Section 4, there might be good reasons to include *PRIM* in the investment equation, on the ground that physical and human capital might be complementary. Also, it might be important to control for *GDP* in the *SPI* equation, to test the hypothesis that 'good things tend to go together', so that richer countries are more stable. Columns (1a) and (1b) of Table 7 control for *PRIM* in the investment equation and for *GDP* in the *SPI* equation, respectively. The coefficients of both variables have the expected signs, although only *PRIM* in the investment equation is significant. Importantly, the coefficients of *SPI* in the investment equation and of *MIDCLASS* in the *SPI* equation remain significant and largely unaffected relative to columns (2a) and (2b) of Table 5. The coefficient of

*SPI* falls in absolute value, from  $-0.57$  to  $-0.40$ : this too is not surprising, since primary school enrollment has a large negative correlation with socio-political instability.

In columns (2a) and (2b) of Table 7 we add the variable *HOMOG* in the *SPI* equation. This variable is defined as the fraction of the population (in 1960) belonging to the main ethnic and linguistic group. Thus, a lower value of this variable implies more ethnic fragmentation, which is likely to be a cause of political instability and mass violence (Hibbs, 1973). The coefficient on this variable has the expected sign but is not significant at conventional levels. Generally, depending on the other variables included in the regression, *HOMOG* has a coefficient which is always negative (as expected) but with varying degrees of statistical significance. The estimates of the remaining coefficients are very similar to those of columns (2a) and (2b) in Table 5.

Columns (3a) and (3b) of Table 7 display the estimate of the system with an income distribution variable appearing directly in the investment equation. The rationale for this specification follows directly from the arguments briefly surveyed in Section 4. The coefficient on *MIDCLASS* in the investment equation is negative, suggesting that a ‘Kaldorian’ link between income distribution and investment is at work: economies with less concentrated distributions of income save and invest less. However, note that the coefficient is statistically insignificant; moreover, as we discussed in Section 4 the proper way to test the Kaldorian hypothesis would be to use measures of the functional distribution of income, which unfortunately is not available for most of the countries of our sample. We also estimated the same system, with the share of the bottom two quintiles of the population or the share of the top quintile as the income distribution variable instead of *MIDCLASS* in the investment equation. In both cases, the coefficient of the income distribution variable is close to 0, and insignificant. These results have two possible interpretations. The first one is that the only effect of income inequality on capital accumulation goes through political instability. The second one is that, once political instability is controlled for, the ‘Kaldorian’ effect and the fiscal redistribution effect offset each other.

We also added several other exogenous variables that, on a priori grounds, are potentially important determinants of investment and socio-political instability. In general, none of these variables changed our results concerning the effects of income distribution on socio-political instability and of the latter on investment. Two of these variables appear particularly interesting: urbanization and government consumption. As argued by Huntington (1968) and Berg and Sachs (1988), urbanization leads to more social demands and political pressure for redistributive policies. Indeed, when we include a measure of urbanization in 1960 among the regressors of the *SPI* equation, its coefficient is positive, but insignificant. To the extent that government consumption is a proxy for the size of government and government-induced distortions, one can argue that it should have a negative effect on investment. On the other hand, government consumption might belong in the

*SPI* equation, as higher expenditure by the government might be used to prevent or defuse social unrest. We tried both specifications: indeed, government consumption has a negative coefficient in both the investment and the *SPI* equation, although only in the latter it is close to being significant. Importantly, both when urbanization and government consumption are controlled for, the coefficients of *SPI* in the investment equation and of *MIDCLASS* in the *SPI* equation are virtually unaffected.

We tried several additional permutations in the specification, using the two indices of political instability and various combinations of the variables discussed so far. Our results (available upon request) confirm the robustness of our findings both on the effects of inequality on political instability and on the effects of the latter on investment.

We did find, however, an interesting exception, which we show in columns (4a) and (4b) of Table 7: our results worsen significantly when we use the enrollment ratio in secondary school (*SEC*), rather than in primary school, to control for human capital. In particular, the coefficient of *SPI* in the investment equation falls only slightly in absolute value, and remains strongly significant; but the coefficient of *MIDCLASS* in the investment equation falls substantially, to  $-0.38$ , and becomes insignificant. These results are due to the high degree of correlation between *SEC* and *MIDCLASS*, which is about 0.6, i.e. roughly double that between *PRIM* and *MIDCLASS* (see Table 4). Because of this pattern of correlations, it becomes hard to disentangle the effects of income distribution on secondary school enrollment and on *SPI* separately, while the problem is less acute when we use instead primary school enrollment.

The high correlation between secondary school enrollment and *MIDCLASS* suggests an additional channel through which income equality may enhance growth and accumulation: in the presence of liquidity constraints due to capital market imperfections, a wealthy middle class can afford to invest in higher education, while an impoverished one cannot. A more extensive empirical analysis of the relationship between inequality and investment in education is left for further research.<sup>15</sup>

An additional way of looking at the robustness of the results is to estimate the model using robust estimation methods. Roughly speaking, robust regression methods provide estimators that downweigh those observations that are ‘outliers’. One dimension along which the robust estimators differ is the definition of an ‘outlier’. Typically, an outlier is characterized by a large residual. We have chosen to estimate the *SPI* and *INV* equations by applying the bounded-influence estimator proposed by Krasker and Welsch (1982). The main reason for this choice is that this estimator identifies and downweighs outliers not only in the residuals’ space, but also in the regressors’ space. As shown by Krasker et al.

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<sup>15</sup> See Perotti (1993) for a theoretical discussion of this issue.

Table 8  
Investment and SPI equations, robust estimation, 1960–85<sup>a</sup>

	<i>INV</i> (1a)	<i>SPI</i> (1b)	<i>INV</i> (2a)	<i>SPIG</i> (2b)
Constant	27.29 (8.66)	24.99 (2.79)	54.35 (5.57)	36.78 (8.04)
<i>GDP</i>	0.06 (0.83)		-0.02 (-0.28)	
<i>SPI</i>	-0.59 (-3.15)			
<i>SPIG</i>			-1.12 (-3.35)	
<i>PPPI</i>	-0.14 (-3.62)		-0.12 (-3.51)	
<i>PPPIDE</i>	0.05 (0.70)		0.01 (0.13)	
<i>PRIM</i>		-0.22 (-2.38)		-0.13 (-2.71)
<i>MIDCLASS</i>		-0.49 (-2.02)		-0.34 (-2.78)
<i>INV</i>		0.30 (0.73)		0.14 (0.68)
<i>LAAM</i>		7.59 (2.21)		1.49 (0.86)
<i>ASIA</i>		3.17 (0.96)		3.62 (1.05)
<i>AFRICA</i>		-0.86 (-0.25)		-1.11 (-0.63)
NOBS	71	71	69	69
<i>s.e.e.</i>	7.21	10.34	6.39	4.03
Rel. eff.	0.94	0.87	0.94	0.87

<sup>a</sup> 2SLS, using the Krasker–Welsh robust estimator. *t*-statistics in parentheses.

(1983), an observation can be very influential and nevertheless the residual corresponding to that observation may be smaller than most other residuals. Since we are estimating a simultaneous-equation model, we implement the 2SLS version of the Krasker and Welsch estimator.<sup>16</sup>

Table 8 shows the Krasker–Welsch estimates of one of the basic specifications of the *SPI* and *INV* equations, both with our index of socio-political instability and with Gupta's. Thus, columns (1a) and (1b) of Table 8 present the 2SLS Krasker–Welsch estimates of columns (2a) and (2b) in Table 5, while columns

<sup>16</sup> Robust estimator for 3SLS have not been devised yet. See Krasker and Welsch (1982) and Krasker et al. (1983) for a theoretical treatment of robust estimators, and Kuh and Welsch (1980) and Peters et al. (1982) for some applications. The estimates of this section are obtained by applying a RATS program implemented in Perotti (1996).

(2a) and (2b) present the 2SLS Krasker–Welsch estimates of the columns (2a) and (2b) in Table 6. One can see immediately that the point estimates of virtually all the coefficients are very similar, and in many cases almost identical, to those of the 2SLS estimators. The main exception is the coefficient of *MIDCLASS* in column (1b), which is  $-0.49$ , against  $-0.68$  in column (2b) of Table 5. Given the well known problems with measuring income distribution from surveys, it is not entirely surprising that the coefficient of *MIDCLASS* should be less robust than the others coefficients in our regressions; however, this coefficient remains significant even in the robust regression.

The relative efficiency of the Krasker–Welsch estimator is always below 0.95, which is often the value used in applied work. This is an indication that the estimates are indeed robust: the less efficient is the Krasker–Welsch estimator relative to the 2SLS estimator, the easier it is for an observation to be considered an outlier.<sup>17</sup> These results are quite reassuring: although there are well known measurement error problems in income distribution and political data, they are not of such a nature as to make the estimates of the model very sensitive to some particular observation.

Finally, we addressed the related issues of heteroskedasticity and misspecification due to measurement errors. We therefore conducted several tests of misspecification and heteroskedasticity on the same systems that appear in Table 5. A first rough indicator of the presence of misspecification possibly due to errors-in-variables problems is provided by a Hausman test using 2SLS and 3SLS estimates. The statistic was never significant at the 10% level. As to heteroskedasticity, we ran a Breusch–Pagan test on the *SPI* equation, assuming that the error variance was proportional to the inverse of initial GDP.<sup>18</sup> Again, the test was never significant. As an additional check, we reestimated the *SPI* equation applying White's heteroskedasticity correction, which in this IV framework becomes White's Two-Stage-Instrumental-Variables estimator (see White, 1980). Again, neither the coefficient estimates nor the *t*-statistics changed substantially.

## 7. Conclusions

Income inequality increases socio-political instability which in turn decreases investment. After an extensive battery of robustness tests, we can conclude that these results in our sample of 71 countries are quite solid.

These results have positive and normative implications. From a positive point

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<sup>17</sup> The reason why relative efficiencies are different in different equations is that we fixed the constant  $c$  in Peters et al. (1982) at a value of 0.55 rather than adjusting it every time to achieve a desired value of relative efficiency.

<sup>18</sup> If errors in measuring income distribution are more severe in poorer countries, for instance because the surveys are conducted with smaller budgets, the induced error variance will be inversely proportional to GDP.

of view they suggest an argument that might help explain different investment and growth performances in different parts of the world. Several countries in South East Asia have had very high growth rates in the post-WWII period. In the aftermath of the war, these countries had land reforms that reduced income and wealth inequality. Furthermore, and, perhaps as a result of this reform, these countries have been relatively stable politically, compared to, say, Latin American countries. The latter, in turn, have had a much more unequal income distribution, more socio-political instability and less growth. A particularly good example of successful Asian countries are the 'four dragons' (Hong Kong, Singapore, South Korea, and Taiwan). Unfortunately, because of data availability, these countries are not included in our regressions. However, they would seem to fit our hypothesis, since these countries have had much more stability and much less inequality than, say, Latin American countries, which had a comparable GDP per capita in 1960.

From a normative point of view, our results have some implications for the effects of redistributive policies. Fiscal redistribution, by increasing the tax burden on capitalists and investors, reduces the propensity to invest. However, the same policies may reduce social tensions and, as a result, create a socio-political climate more conducive to productive activities and capital accumulation.<sup>19</sup> Thus, by this channel fiscal redistribution might actually spur economic growth. Therefore the net effect of redistributive policies on growth has to weigh the costs of distortionary taxation against the benefits of reduced social tensions.

This paper, not unlike the related literature surveyed in the introduction, focuses on policy outcomes (investment, growth etc.) and relates them to socio-economic variables. The next step in this line of research is to look more explicitly at actual policy instruments, as Perotti (1996) has started doing. The link between politics and economic outcomes goes through policy choices, particularly, in this context, fiscal policy. Several questions are left open: what are the effects of income inequality on the degree of redistribution implemented in different political systems? Who actually benefits from such redistributions? What are the distributional effects of different spending programs? Do the very poor really benefit from government programs toward them? Answering these questions requires more disaggregated fiscal policy data than those used so far.

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<sup>19</sup> A similar argument has been put forward by Sala-i-Martin (1992). A related argument, suggested by Fay (1993), focuses on illegal activities. Higher inequality fuels crime against private property; thus redistributive policies protect property rights by reducing crime.

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