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THEORY AND EVIDENCE ON THE POLITICAL ECONOMY OF GROWTH.

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Abstract:

Some recent developments in the literature on the political economy of economic growth are considered in this paper. First, limitations of traditional cross-sectional analysis are discussed. Attention is focused on the problems of omitted variables and model uncertainty. Advantages and disadvantages of alternative methods are discussed as well as evidence obtained from the application of panel techniques and time-series analysis. Second, the relationship between initial inequality and subsequent economic growth is reconsidered in the light of the empirical evidence recently produced by contributions that make use of panel models and high-quality data on income distribution. Third, the role of special interest politics is investigated. Other than lobbying, the "common-pool" problem is an instance of main interest in the political economy literature. It predicts that more fragmented governments are associated to lower growth. I test this prediction on a panel of western European countries. Results appear to be consistent with the theoretical argument.

JEL Classification: O40, D70.

Keywords: Political variables, growth empirics and theory.

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Introduction

The search for the determinants of economic growth is a very active area of study in the economic profession. My reading of this literature is that more and more attention is being devoted to political and institutional factors as potential sources of cross-country variation of growth rates. In this paper, I intend to investigate what I believe are the most recent advances in the political economy of growth. I start in Section 1 with an econometric issue. The large majority of empirical results concerning the role of political variables have been obtained within the standard framework of informal cross-country growth regressions. However, the estimation and the interpretation of such regressions involve substantial problems that are often neglected, such as the one of omitted variables or model uncertainty. In Section 2 I turn to the issue of how income inequality affects subsequent growth[1]. A broad consensus has now emerged in the literature that income inequality is harmful for growth. The attention of scholars has been therefore focused on identifying the channels through which inequality lowers growth. Recently, this common belief has been challenged. Once more reliable measures of inequality are used to estimate panel (rather than cross-country) models, the sign of the relationship becomes positive. This has clearly spurred new interest towards alternative theories that predict a growth-enhancing effect of income inequality. Finally, in Section 3 I look at a new frontier of theoretical research and conduct an econometric analysis of the predictions generated by one of such models.

Section 1. Econometric issues

1.1 Theoretical framework and augmented cross-section regressions.

The common theoretical framework underlying most of the empirical framework on the determinants of growth is the neo-classical (Solow) model augmented with human capital, originally proposed by Mankiw, Romer and Weil (1992), henceforth MRW. The aggregate production function for a generic country is written as:

(1.1) $Y = K^{a} H^{b} (AN)^{1-a-b}$ with $\alpha > 0$, $\beta > 0$, $\alpha + \beta < 1$.

[1] Notice that I will focus on the impact of inequality on the dynamics of growth and not on the contemporaneous relationship between the two (i.e. the Kuznets curve). For an optimal survey of how growth affects inequality see Aghion et al. (1999).

where Y is aggregate income, K denotes the stock of physical capital, H is the stock of human capital, N is labour force and A is an index of technological efficiency.
The following assumptions are stated with respect to factors accumulation:

(1.2.a) $\dot{A}/A = x \geq 0$ and the level of A at time $t = 0$ is A(0) > 0;

(1.2.b) $\dot{N}/N = u \geq 0$ and the level of N at time $t = 0$ is N(0) > 0;

(1.2.c) $\dot{K} = t_k Y - d_k K$ with $t_k, d_k > 0$

(1.2.d) $\dot{H} = t_h Y - d_h K$ with $t_h, d_h > 0$

Rates of physical and human capital investment (τ_k and τ_h) are thus assumed to be constant. The additional restriction that both types of capital depreciate at the same rate is also imposed (that is, $\delta_k = \delta_h = \delta$). By approximating around the steady state, MRW show that the growth rate of income between time 0 and time t is given by:

$$\ln y(t) - \ln y(0) = (1-e^{lt})\ln A(0) + (t-e^{lt})x + (e^{lt}-1)\ln y(0) + (1-e^{lt})\frac{a}{1-a-b}\ln t_k + \\ + (1-e^{lt})\frac{b}{1-a-b}\ln t_h - (1-e^{lt})\frac{a+b}{1-a-b}\ln(d+u+x) \quad (1.3)$$

where y denotes per-capita income, t denotes time and $l = -(1-a-b)(d+u+x) < 0$ is the rate of convergence to the country's steady state (conditional convergence).
Equation (1.3) identifies four basic determinants of growth: income at time 0 (the so called "initial level of income"), human capital investment, physical capital investment and labour force growth (which is often assumed to be equal to population growth). It is worth stressing the role of initial income. As $e^{\lambda t} < 1$, a higher initial level of per-capita income reduces subsequent growth. This is the *conditional convergence result*: given two countries identical under all respects except than for initial income, the poorer of the two will grow faster during the transition to steady state. Notice that this is not equivalent to say that poorer countries will completely catch up with richer ones since steady states are different across countries.
A typical problem in the econometric implementation of equation (1.3) is that the initial level of technological efficiency $A(0)$ should be included among the set of regressors. However, given the lack of suitable proxies for A, the term in $A(0)$ tend to be omitted. This omission in turn implies that results from the cross-sectional estimation of the growth regression are most likely to be biased. A possible solution is to parametrize A. This means augmenting the basic set of regressors to include a

vector of additional explanatory variables of which *A* should be a (linear) function. The main difficulty in following such a route is that it is not clear what lays beneath technological efficiency. There are many factors that may affect the aggregate amount of output, given the aggregate amount of inputs, and most of these factors (once identified) are also hard to measure empirically. The consequence is that most researchers have estimated cross-sectional growth regressions that include a variety of different explanatory variables often chosen *ad hoc* or on the grounds of simple *prima facia* relevance to growth and technological efficiency. The general form of these augmented (or informal) growth regressions[2] can thus be specified as:

$$(1.4) \qquad y = a + b_1 x_1 + b_2 x_2 + ... + b_n x_n + e$$

where y is a vector of rates of economic growth, $x_1 \ldots . x_n$ are vectors of explanatory variables and $b_1 \ldots b_n$ are vectors of parameters to be estimated. As noted by Sala-i-Martin (1997, page 2), the set of explanatory variables "vary across researchers and across papers". He reports that 63 variables have been found to be significant in at least one published paper.

Most of the results on the political determinants of economic growth are obtained from the cross-sectional estimation of model (1.4). Table 1 in the Appendix reports a summary of main contributions and results. It appears that the type of regime (democracy vs. dictatorship) and income inequality are probably the two most investigated political-economic explanations of growth. Notice also the large variety of empirical proxies used to capture the impact of political instability.

1.2 Problems with cross-section estimation and alternative econometric procedures.

Rather frequently, researchers report that regional dummy variables display significant estimated coefficients when added to the r.h.s. of cross-country regressions. This is a signal that some region-specific (or even country-specific) factor affects economic growth and it is not correctly captured by the explanatory variables of the model. Furthermore, it is often the case that the inclusion of the regional dummies makes the estimated coefficients on other regressors not statistically different from zero. This suggests that these coefficients do not capture the impact of the associated regressors on growth, but rather, they account for the role of the omitted regional-specific effect. This is an instance of the omitted variables problem. When some of the regressors included in the model are correlated with the omitted variable (as it could be the case, for instance, when the

[2] Regressions of this type are sometimes called Barro's cross-country growth regressions since they are based on the seminal work by Barro (1989 and 1991).

unobservable level of technological efficiency is neglected in the econometric implementation of the MRW equation), then parameter estimates are biased.

The determination of the direction of this bias can be difficult to be determined *a priori*. A typical example is the bias generated by the omission of country-specific effects in growth regressions that include a measure of income inequality on the r.h.s. As noted by Forbes (2000), suppose that the country-specific effect is represented by country's degree of capitalism and country's degree of bureaucratic inefficiency and that both factors are omitted from the model specification (because not observable and difficult to measure). The degree of capitalism is positively correlated with both inequality and growth and therefore its omission generates a positive bias on the estimated coefficient of the measure of income inequality. The degree of bureaucratic inefficiency is positively correlated with inequality and negatively correlated with growth. Its omission therefore generates a negative bias on the estimated coefficient of the measure of income inequality. The overall direction of the bias would thus be ambiguous.

If country-specific effects are time invariant, then consistent parameter estimates can be obtained by applying panel data techniques. This is done, for instance, by Benhabib and Spiegel (1997), who estimate the following growth regression:

$$(1.5)\quad \ln y_i(t) - \ln y_i(t-1) = a + b_1 \ln H_i(t) + b_2 \ln H_i(t)\left(\frac{y_{\max}(t)}{y_i(t)}\right) + b_3(\ln N_i(t) - \ln N_i(t)) + \\ + b_4(\ln K_i(t) - \ln K_i(t)) + b_5 Z_i(t) + e_{it}$$

where *i* now denotes a specific country, y_{max} is the output per worker in the country with the highest output per worker, $Z_i(t)$ is a set of "ancillary" variables (that include the degree of political instability and an indicator of income inequality) and the constant term *a* is decomposed into economy-specific and time-specific effects: $a = \phi_i + \theta t$. This decomposition permits to adjust for country-specific (time invariant) characteristics through fixed effects.

The theory underlying model (1.5) is one of endogenous growth, where total factor productivity (that is, $\ln A_i(t) - \ln A_i(t-1)$) is determined by the current level of human capital (rather than the growth of human capital) and the disparity of technology levels from the leader nation (proxied by $y_{max}(t)/y(t)$). Benhabib and Spiegel also estimate a reduced form of (1.5) that includes the lagged value of per capita income instead of the interactive term in the disparity of technology. They obtain interesting results on the political determinants of growth. Political instability (measured by a dummy variable that takes value 1 if in period *t* a coup or a major government change is observed)

and income inequality (measured by the Gini coefficient on land and income) do not significantly affect the rate of economic growth. These results are quite different from those obtained in cross-sectional regressions and summarised in Table 1. In particular, it is clear from Table 1 that there is a large consensus in the literature that the relationship between inequality and growth is negative and statistically significant. With respect to political instability the consensus is less strong (there is also higher variation in the definition of proxies for instability across papers), but still a large proportion of contributions conclude that the relationship is negative and again statistically robust.

The use of panel data estimation techniques also permits to overcome the problem of possible endogeneity of regressors and growth. For instance, if it is true that political instability is a possible determinant of economic growth, it might also be true that economic growth (or the economic performance in general) affects the degree of political instability and violence. Thus it can be problematic to interpret the estimated coefficient on an indicator of political instability in terms of cause/effect. The econometric literature identifies instrumental variables estimation as an obvious strategy in case of potential joint endogeneity of the dependent variable and one or more of the explanatory variables. The shortage of good instruments implies that often the best possible way to proceed is to instrument regressors by their lagged values. Clearly, this is possible only within a panel framework and only if the time span of data is sufficiently long. As a matter of fact, in the previously mentioned work, Benhabib and Spiegel (1997) tackle the issue of joint endogeneity of economic and political regressors by using lagged values of endogenous variables as instruments and then applying the generalised method of moments estimation. Along similar lines are the studies by Caselli et al. (1996) and Easterly et al. (1996).

Another limitation of cross-sectional regressions relates to parameter heterogeneity. As pointed out by Durlauf and Quah (1998) and Temple (1999), cross-country studies always include a very large number of countries characterised by relevant differences in their social, political and institutional structure. This implies that the parameter estimates obtained from a common regression are difficult to interpret and possibly inconsistent. Again, a feasible way out is panel estimation. Ideally, one would estimate a panel with stochastic parameters, but this requires longer time-series of data than those currently available for most countries. In the wait of longer time-series to become available, the larger number of degrees of freedom that a panel allows can be exploited to implement less sophisticated (but still effective) methods, such as robust estimation, sample split and group dummies.

In general, panel estimation might be used to improve on the cross-sectional results. Two caveats are however necessary. First, cross-section analysis is not to be completely disregarded. It has provided some important and useful insights and it can be a valuable complementary instrument of

analysis (to be combined, for instance, with historical studies or even with panel analysis). Second, panel estimation is not immune from shortcomings. One is that it does not adjust for omitted variables that vary across time. Another relates to fact that to depurate growth rates from short-run disturbances, scholars often average annual growth rate over *n*-year periods. But the choice of *n* is often arbitrary; that is, there is no clear reason why some choose 5-year periods whilst other choose 10-year periods. The problem is substantial if it is true that, as the results in Forbes (2000) seem to suggest, not necessarily estimates obtained from 5-year averages are identical to estimates obtained from 10-year averages. Then simply changing the length of observation spells would lead to different conclusions on what determines growth.

The choice of the estimator to be used with the panel model is also subtle. Suppose that the regression equation is specified so to include per-capita income in period *t-1* as a determinant of the growth rate of per-capita income in period *t*. Then the model can be immediately re-written as a per-capita income regression with a lagged dependent variable. In this case, the fixed effects and the random effects estimators, which are so popular among scholars, can be significantly biased. Alternative estimation methods (such as the Arellano-Bond Generalised Method of Moments) requires that a relatively large sample of observations is available for standard errors of estimated coefficients to be correctly computed. Otherwise, if the sample is too small, then standard errors will also be excessively small and the statistical significance of estimated coefficients artificially increased.

In alternative to (or in association with) cross-section and panel data models, time-series analysis could be used, at lest to the extent that sufficiently long spans of good quality data are available for the country under investigation. Quah (1992) and Bernard and Durlauf (1996) use unit roots and cointegration analysis to investigate the issue of β-convergence. In the field of political economy, a time-series approach is employed by Fielding (2000) to evaluate the consequences of the *Intifada* on the rate of capital accumulation in Israel. Since the series of his indicators of political instability (number of Israelis killed, number of Arabs killed, rate of growth of the number of buildings constructed in the West Bank area) are not integrated of order 1, he first estimates a cointegrating relationship between investments in two types of goods (non-residential construction and equipment), real interest rate (adjusted for capital depreciation), real wage rate and output of the average firm. Then he constructs a regression model where the change in investment is the dependent variable and the set of regressors include economic variables, the political variables (inclusive of a dummy to isolate periods of left-wing government) and the residuals from the cointegrating vector estimated for investment. He obtains that both the number of Israelis killed and the rate of growth of Jewish settlements in the West Bank and Gaza areas have a significantly

negative impact on investment in non-residential constructions. Manufactoring and equipment investment is instead significantly lower when the total number of deaths and rate of growth of Jewish settlements increase. Fielding also conducts tests to verify whether political indicators are exogenous to investment and he finds support for the hypothesis of weak exogeneity (so that the casuality effectively goes from political factors to capital accumulation).

1.3 Model uncertainty and robustness of results in cross-section growth regressions

A key issue in the econometric analysis of growth determinants concerns the specification of the regression model. As previously noted, most of the work in this area is based on the cross-sectional estimation of equation (1.4). The definition of the set of explanatory variables is often arbitrary: researchers simply add regressors with prima facia relevance to growth in the hope to obtain statistically significant estimated coefficients and an overall good fitness of the model. This exercise has surely generated interesting results and stimulated further empirical as well as theoretical work. Nevertheless, the proliferation of explanatory variables and the relatively loose link with the theory rise the question of the "robustness" of these results.

The standard approach in the cross-section literature is to estimate a growth equation with a basic set of explanatory variables, identify those coefficients that pass a zero restriction test at some given confidence level (usually 1%, 5% or 10%) and then check the robustness of these findings by estimating several alternative model specifications to see how the estimated coefficients change. This sensitivity analysis is successful, in the sense that key findings are regarded as being robust, if the variables of interest display stable (in sign and size) and statistically significant coefficients when the set of the other regressors changes. However, Levine and Renelt (1992) argue that this procedure is not conclusive and that most of the findings reported in the literature might not be robust to more systematic tests. More specifically, they refer to the Extreme-Bounds Analysis (EBA) originally proposed by Leamer (1983) and obtain that for almost none of the 50 look at a robust correlation with growth can be identified. The only exceptions are the correlations between growth and the share of investment in GDP and between the investment share and the ratio of international trade to GDP. In particular, with respect to political variables, they conclude that indexes of revolutions and coups and civil liberties are not robustly correlated with growth. However, they do find a robust correlation between revolution and coups and the share of investment.

Sala-i-Martin (1997) challenges the conclusion of Levine and Renelt by arguing that the EBA is unnecessarily restrictive. In a nutshell, the idea incorporated in the EBA is that for a correlation

between a generic regressor *z* and the rate of growth to be robust, the estimated coefficient on *z* must be found statistically significant in a very large number of different model specifications.[3] Sala-i-Martin proposes a less extreme test. For each variable *z* he estimates 30,856 regressions and computes the cumulative distribution function lying on each side of zero (CDF(0)) of the estimator of the coefficient on *z*. Then, assuming that the usual confidence level is 95%, robust correlations are those for which the CDF(0) is above 0.95.[4] An implication of these methods is that a variable whose coefficient is not significant 100% of the times is not necessarily classified as non robust (as it is the case instead with the EBA). That is, CDF (0) might be above the threshold 0.95 even if in some of the 30,856 tries the estimated coefficient changes sign or becomes not different from zero.

Sala-i-Martin provides two sets of results, one refers to the case where the group of fixed variables (see footnotes 3 and 4) does not include the investment rate and the other refers to the case where the investment rate is included as a fixed variable (and hence estimated coefficient measures the impact of the associated variable on the "level of efficiency"). Findings are rather similar in the two cases. With respect to political variables he finds that the index of civil liberties (but not the index of democracy), the number of revolutions and coups, a dummy variable for war and an index of rule of law are all robustly correlated with growth when investment is not among the fixed variables. For the number of political assassinations and an index of political instability the CDF(0) is instead much below the significance threshold. When investments are included as a fixed variable, both the dummy for war and the number of revolutions and coups do not robustly correlate with growth. This means that wars and frequency of irregular government transfers affect economic growth mostly through investment, whilst for the rule of law and civil liberties there seems to be also an effect on the level of efficiency. A robust impact on the level of efficiency is also traced back to the degree of enforcement of political rights. However, the aggregate level of democracy of the country does not seem to correlate robustly with growth, neither through efficiency nor through investment.

In a recent contribution Ley and Steel (1999) implement a test of robustness somehow similar to the one proposed by Sala-i-Martin, but based on Bayesian Model Averaging (BMA). In line with the Bayesian approach, for each potential determinant of growth they compute posterior probabilities of

[3] To be precise, let *S* be the set of all variables whose correlation with growth has to be tested (i.e. *S* = 50 in Levine and Renelt). Then, four of these variables (initial level of income, investment rate, secondary school enrolment rate and the rate of population growth) are always included in the regression, together with *z* and up to three other variables from the pool *S*. The total number of regressions estimated to evaluate the robustness of the correlation between *z* and economic growth is equal to the number of combinations of three variables out of the pool *S* (excluded the four variables which are fixed and always included). If in just one of these regressions the sign of the coefficient on *z* changes, or becomes not statistically different from zero, then the correlation between *z* and the rate of growth is considered to be not robust.

[4] As Levine and Renelt (1992), Sala-i-Martin estimates regressions with four fixed variables, the variable *z* and exactly three other regressors out of the pool of *S* (in his case *S* = 62). Then the total number of regressions estimated for the variable *z* is equal to the number of combinations of 58 variables in sets of three: 58!/[3!55!] = 30,856.

inclusion in the growth equation. Variables that display a posterior probability above 0.8 are considered as "important regressors", variables that display a posterior probability below 0.2 are regarded as "not important". Ley and Steel use the same data-set as Sala-i-Martin and henceforth their results can be compared. Two main political variables have posterior probability above 0.8: the index of rule of law (which is also found to be robustly correlated with growth by Sala-i-Martin) and the index of ethno-linguistic fractionalisation, which is often taken to be a proxy for socio-political instability. Consistent with the findings reported by Sala-i-Martin is also the conclusion that the war dummy is not important. Of the other political indicators considered by Sala-i-Martin, revolutions and coups are the least important determinants of growth according to Ley and Steel, with a posterior probability of less than 5%. Civili liberties and political rights lay instead in the large area of variables with posteriors included between 0.2 and 0.8. [5]

All in all, once model uncertainty is acknowledged and specific tests of robustness undertaken, there is still evidence that various political factors affect growth. The EBA test is extremely restrictive and leads to the conclusion that almost nothing robustly correlates with growth. However, among the very few things that correlates with investment (which in turn correlates with growth) is the average number of revolutions and coups in a country. The test based on the CDF (0) and the BMA test instead identifies several variables which are important determinants of growth. Although results are not fully consistent across these two latter tests, it seems that political violence and limitation of civil liberties do have a robust growth-depressing role.

Section 2. Issues on the relationship between income inequality and economic growth.

2.1 The "common belief": initial inequality is harmful for subsequent economic growth.[6]

Theoretical contributions

A striking piece of evidence that appears from Table 1 is the widespread agreement in the empirical literature on the fact that initial inequality in the distribution of income or wealth negatively affects subsequent economic growth. Three different mechanisms have been identified that might explain this relationship: endogenous fiscal policy, socio-political instability and credit market

[5] Ley and Steel do not keep a set of fixed regressors. Thus the investment rate enters some of the regressions estimated for the generic regressor *z*, but not all of them.

[6] By "initial" it is meant that inequality is pre-determined to economic growth. In theoretical models, it is inequality in the first period that determines growth in the subsequent periods. In applied work, inequality is measured at the beginning of the sample period over which economic growth is computed.

imperfections. This latter does not explicitly builds on political-economic considerations and will thus receive less attention.

Models of endogenous fiscal policy use the median voter theorem to determine the capital tax rate as a function of the distribution of income and wealth across individuals in the economy. In Persson and Tabellini (1994) taxation is purely redistributive and individuals differ in terms of their initial endowment of resources available for capital investment. Under majority voting and with single peaked utility functions, the tax rate chosen by voters is equal to the tax rate preferred by the individual at the median of the distribution of endowments. The more unequal the society (that is, the more right-skewed the distribution), the smaller the median endowment relative to the average and the higher the tax rate preferred by the median voter. By reducing after-tax return from capital accumulation, higher tax rates negatively affect economic growth. Alesina and Rodrik (1994) reach the same conclusion, but in a setting where capital taxation is used to finance public services which in turn increase productivity of labour and capital (as in Barro, 1990). Chang (1998) considers the case where government is shared by two parties representing different constituencies. Tax rates are not determined by the application of the median voter theorem, but result from an inter-party bargaining game. The sustainable equilibrium outcome of this game is characterised by the fact that a wider gap between capitalists and workers (the two constituencies) generates a more redistributive policy which in turn reduces the rate of economic growth.

Models of socio-politcal instability posit that a more unequal distribution of wealth is a source of social distress and illegal seizure of power (Gupta, 1990 and Alesina and Perotti, 1996). When a large group of very poor face a small group of very rich, then the discontent of the former is most likely to degenerate into revolutions, coups and riots. Furthermore, as suggested by Sala-i-Martin (1992) and Fay (1993), poorer individuals often engage in illegal activities. Both political violence and widespread crime reduce entrepreneurs' incentive to invest by making them more uncertain about the future course of economic policy (revolutions and coups might be followed by the nationalisation of private companies, for instance) and the possibility to appropriate the return from their investments. This argument is close in spirit to the case of the "Tragedy of the Commons" (Tornell and Velasco,1992) where the lack of enforcement of property rights is a source of under-investment and low growth.

Finally, models that incorporate credit market imperfections build on the work by Galor and Zeira (1993) and Aghion and Bolton (1997). The basic idea is that in the presence of such imperfections, poorer individuals cannot exploit profitable investment opportunities. For instance, they cannot invest in education or, alternatively, provide little effort in trying to make a risky investment

successful. More inequality implies that more agents are prevented from investing and hence that economic growth (engined by physical and human capital accumulation) is *ceteris paribus* lower.

Empirical evidence on the importance of the various channels

The above mentioned models all generate the same "reduced form" prediction: initial inequality is harmful for subsequent economic growth. However, their predictions concerning the channel through which inequality affects growth are rather different. According to the models of endogenous fiscal policy (i) more initial inequality generates more redistribution and (ii) more redistribution reduces economic growth. The models of socio-political instability instead predict that (i) more inequality generates more instability and (ii) instability negatively correlates with economic growth. Finally, the credit market imperfections argument suggests that (i) for any degree of capital market imperfections, more inequality is associated to a lower investment in education (or human capital accumulation) and (ii) human capital accumulation positively correlates with economic growth. Table 2 reports a summary of findings. Below I limit the discussion to the empirical work on the first two classes of models (those that are based on political-economic considerations).

The endogenous fiscal policy argument does not appear to receive much support from the data. None of the papers surveyed reports that the initial level of inequality is positively correlated to the extent of redistribution (as measured by the GDP share of social security or the marginal tax rate). At the same time, redistribution tends to be a positive (rather than negative) determinant of economic growth. Perotti (1996) provides systematic evidence on both points. He estimates a system of two structural equations. The first one is a growth equation, where the set of explanatory variables include the marginal tax rate. The second one is an equation for the marginal tax rate that includes on the r.h.s. a measure of pre-determined income inequality (share in income of the third and fourth quintiles at the beginning of the sample period). The system is estimated by two-stages least squares. The coefficient on the marginal tax rate in the growth equation is positive and statistically significant at usual confidence levels. This means that more redistribution is positive for economic growth. The coefficient of the index of income equality in the regression of the tax rate is instead negative, as predicted by the theory, but largely insignificant at usual confidence levels. That is, more unequal societies are not necessarily those that undertake more redistributve policies. Results do not change when the system is re-estimated on the sample of only democratic countries and when different proxies for redistribution and inequality are used.[7]

[7] The median voter theorem is most appropriate to represent the political mechanism in a democratic country. Therefore, it might be argued that predictions from the models of endogenous fiscal policy should be consistent with the experience of democracies.

Certainly more supported by the evidence is the theory of socio-political instability. As Table 2 shows, all papers surveyed report a positive correlation between inequality and instability, whilst Table 1 displays a rather long list of contributions where the coefficient on instability in the growth regression is negative. A typical problem encountered by researchers is the potential joint endogeneity of socio-political instability and growth. If instability is not measured at the beginning of the sample period, but as the sample period average, then its estimated coefficient in a cross-sectional growth regression does not provide information on the direction of the casual relationship. Alesina and Perotti (1996) address this econometric issue by estimating a system of two simultaneous equations, one for the ratio of real domestic investment to real GDP (INV) and the other for an index of socio-political instability (SPI). SPI is among the explanatory variables of the investment equation, whilst INV and an index of equality of income distribution (EQ) are among the regressors of the socio-political instability equation. Notice that, to the extent that investment is the engine of economic growth, the effect of SPI on INV translates into an effect on per-capita income growth. The index of SPI is computed for each country in the sample as the first principal component of disaggregated data on political death, assassinations, coups and the country's degree of democracy. It turns out that the estimated coefficient on EQ in the regression of SPI is negative and statistically different from zero. Thus, more equal societies do seem to experience a lower degree of social violence. The coefficient on INV is instead not different from zero. In the regression of INV, the coefficient on SPI is negative and largely significant. This means that even after controlling for possible joint endogeneity, there is clear evidence that socio-political instability negatively affect investments and hence growth. Perotti (1996) adopts a similar procedure, but replaces the investment equation with a standard growth equation. He obtains results that are fully consistent with those reported by Alesina and Perotti: inequality determines instability and instability determines growth.

2.2 A new way of looking at the issue: high quality data and fixed effects estimators.

An important issue in the empirical analysis of the relationship between income inequality and economic growth is the one of possible measurement errors due to the relatively poor quality of available income inequality data.[8] However, a new data-set has been recently made available by Deininger and Squire (1996) that contains only "high quality" data. These are data that satisfy three

[8] Most of the studies reported in Tables 1 and 2 make use of three data-sets: Paukert (1973), Jain (1975) and Lecaillon et al. (1984). Paukert himself admits that some of the observations in his data–set are "of rather doubtful value" (Paukert, 1973, pag. 125). The issue of the quality of income distribution data is also addressed by Perotti (1996).

basic quality standards: (i) they are based on household surveys and not estimated from national accounts statistics, (ii) they have comprehensive coverage of all sources of income, (iii) they are representative of the population at national level, rather than of only some specific sectors (such as urban population or taxpayers).

Interestingly, Deininger and Squire (1996 and 1998) report that the number of observations in existing data-sets that satisfy these three quality standards is rather small. For instance, out of the 405 data points in Jain (1975), only 61 can be regarded as "high quality". Similarly, the data-set used by Persson and Tabellinni (1994), which is based on Paukert (1973), contains 55 observations, but only 18 of them meet the quality standards. Of better quality are the data used by Alesina and Rodrik (1994) and Perotti (1996), but still quite a considerable quota of their sample observations do not satisfy the criteria. Give that measurement errors are a potentially very important source of biased estimates (see Temple, 1999), the Deninger and Squire data-set offers a new way of looking at the issue of how inequality determines economic growth and all most recent studies in the area make use of it.

Deininger and Squire (1998), DS henceforth, use their data to estimate the following cross-section growth regression:

$$(1.6) \qquad g_i = a + b_1 GDP60_i + b_2 INV_i + b_3 GINI_i + e$$

where g is the growth rate of per-capita income, *GDP60* is per-capita income in 1960, *INV* is capital accumulation (as defined by Summer and Heston, 1991), *GINI* is the Gini coefficient of income or land, i denotes a generic country and g and *INV* are averaged over the sample period 1960-1992.

Equation (1.6) is a simple version of a Barro's type equation. A problem with its implementation is that the term on income inequality (*GINI*) should pre-determined relative to growth. That is, one would ideally use observations on the Gini coefficient in, or around, 1960. However, for the Gini coefficient of the income distribution, the high quality data of DS go back to 1960 only for a very small group of countries. To avoid estimating a regression with an extremely small number of degrees of freedom, the authors adopt the two following strategies. First, they estimate a regression using averages of all the observations available (for a given country) of the Gini coefficient of income over the whole sample period. In other words, they average the variable *GINI* over the period 1960-1992 as it is done for g and *INV*. In fact, this implies that *GINI* is not pre-determined to growth. Although DS argue that Gini coefficients are rather stable within countries, there is plenty of theoretical and empirical literature suggesting that growth and income distribution are jointly

endogenous.[9] Henceforth, estimated coefficients on *GINI* would not be informative on the direction of the casual relationship. The second strategy DS adopt is to use the Gini coefficient on land distribution, for which observations at 1960 are available for a larger number of countries.

Estimates of the coefficient β_3 in equation (1.6) are broadly consistent with previous results in the literature: inequality negatively correlates with growth. However, the inclusion of regional dummies for Latin-America, African and Asian countries makes the estimated coefficient β_3 not statistically different from zero when inequality is measured by the average income Gini and significant only at the 10% level of confidence when inequality is measured by the 1960 land Gini. Of the regional dummies, only the one for Asian countries displays a significant (positive) coefficient. Interestingly, when both measures of inequality (average income Gini and 1960 land Gini) are included on the r.h.s. of equation (1.6) together with the three dummies, the coefficient on average income Gini remains insignificant, whilst the one on 1960 land Gini becomes significant at around the 5% level of confidence. The same results are obtained when the growth regression is estimated only on the group of developing countries (in this latter case, however, the very small number of observations, 27, makes results more difficult to interpret). Finally, when DS split the sample of countries between democratic and non democratic countries they find that (land) inequality affects growth in the second, but not in the first group.

Overall, DS obtain results which are not particularly innovative relative to the studies that use data-sets of lower quality. Moreover, the DS analysis is based on the cross-sectional estimation of a growth regression and therefore all the methodological instances raised in Section 1 can be advanced. In particular, the results concerning the inclusion of regional dummies might indicate that there are omitted regional or country-specific effects.

Benhabib and Spiegel (1997) combine the high-quality data of DS with panel estimation in order to control for time-invariant, country specific effects. Their basic regression model is given by equation (1.5), with income Gini coefficients of high quality included among the set of ancillary variables *Z*. Using a fixed effect estimator, Benhabib and Spiegel find that the coefficient on the inequality measure is negative, but again not statistically different from zero. The result holds when the regression is re-estimated without fixed effects; that is, using a simple pooled OLS estimator. Similarly, when the lagged value of per-capita income replaces the term $\ln H_i(t)[y_{max}(t)/y_{it}]$ in equation (1.5) basic findings on the impact of inequality are not altered. Benhabib and Spiegel also consider an interactive term *GINI*LLY*, where *LLY* is a measure of the ratio of liquid liabilities of the financial sector to GDP.[10] The idea is that, following models that incorporate capital market

[9] See, for instance, the survey by Aghion et al. (1999).

[10] Benhabib and Spiegel choose the monetary aggregate M2 as a proxy for liquid liabilities.

imperfections, inequality is most likely to have a negative impact on growth at low levels of a country's financial development. But the coefficient on this interactive term is again not statistically different from zero. Both, income Gini coefficient and the interactive term are also found to play no relavant role in physical and human capital accumulation.[11] This pattern of results thus represents a challenge to the common belief that income inequality significantly reduces subsequent economic growth.

2.3 Empirical and theoretical challenges to the "common belief"

Perotti (1996) and Deininger and Squire (1998) both find that the inclusion of regional dummies in the growth regression dramatically reduces the level of significance of the estimated coefficients on measures of income inequality. Controlling for country-specific, time invariant fixed effects, Benhabib and Spiegel (1997) conclude that income inequality does not significantly affect the rate of economic growth or factors accumulation. All these are results that question the "common belief" that a more unequal distribution of wealth reduces growth A further important challenge to this belief is represented by the findings reported by Forbes (2000). Similarly to Benhabib and Spiegel (1997), she uses the high quality DS data-set to estimate a panel model based on the following growth equation:

$$g_i(t) = a_i + h(t) + b_1 GINI_i(t-1) + b_2 GDP_i(t-1) + b_3 EDUCM_i(t-1) + \\ + b_4 EDUCF_i(t-1) + b_5 PPPI_i(t-1) + m_i(t) \tag{1.7}$$

where g_i(t) is the average annual growth rate for country *i* in period *t*, $GINI_i$(t-1) is the income Gini coefficient for country *i* in period *t-1*, GDP_i(t-1) is log of per-capita income in country *i* in period *t-1*, $EDUCM_i$ (t-1) and $EDUCF_i$ (t-1) are the average years of secondary schooling in the male and female population respectively for country *i* in period *t-1*, $PPPI_i$(t-1) is the price level of investment (measured as the PPP of investment/exchange rate relative to US) for country *i* in period *t-1*, α_i are country dummies, $\eta(t)$ are period dummies and $\mu_i(t)$ are disturbances.

Notice that g_i(t) in equation (1.7) is simply equal to GDP_i(t) – GDP_i (t-1). Operating this substitution on the l.h.s. and rearranging terms, one immediately notices that equation (1.7) involves

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[11] The investment equation is specified as: INV_{it} = constant + GDP_{it} + Z_{it}, where Z_{it} is an ancillary variable (the interactive term GINI*LLY, for instance). The human capital accumulation equation is specified as: $\Delta LAB*EDUC_{it}$ = constant + GDP_{it} + Z_{it}, where ΔLAB is the annual growth rate of labour force and EDUC are the average years of schooling for adults over 25 years of age at time *t*.

a lagged dependent variable (GDP). Both the fixed and the random effect estimators are biased in this case. The impact of this bias is particularly strong when the panel consists of a rather long cross-section dimension relative to the time dimension. In Forbes' sample, 45 countries are included, the length of generic period *t* is set equal to five years and the total sample period is 30 years (1965-1995). Thus, for each country, at most 6 observations are taken: the fixed and random effect estimators are likely to be severely biased. To correct for this bias, Forbes adopts the Arellano and Bond Methods of Moments (Arellano and Bond, 1991). She obtains that the estimated coefficient on GINI is positive and strongly significant at usual confidence levels.[12] That is, she obtains that more income inequality is positive for future economic growth. The result is robust to changes in the model specification and in the definition of variables.

A few caveats must be noticed. First, when applied to small samples, the Arellano and Bond Method generates excessively small standard errors, thus artificially increasing the statistical significance of estimated coefficients (see Blundell and Bond, 1998). It might well be the case that inequality has no relevant impact on growth (as it is found by Benhabib abd Spiegel, 1997), but that the small sample bias of the estimator leads to the conclusion that the positive coefficient is significant. Second, the focus on high quality income data might produce a sample selection bias. It is frequently observed that better data are available from richer and more equal countries. In fact, Forbes notes that half of her sample consists of OECD countries and no Sub-Saharan country is represented. In her sensitivity analysis she explicitly tackles this issue by experimenting with alternative functional forms of the basic specification. In particular, she finds that squared and cubed terms on inequality do not display significant coefficients. She therefore rejects the hypothesis of a non-linear relationship between inequality and growth. This in turn implies that unbalanced regional coverage is not likely to seriously affect econometric results.

Third, the choice of a five year period is arbitrary. In fact, when she re-estimates the model taking ten year averages, she obtains that the coefficient on inequality is still positive, but now not significant at usual confidence levels. Fourth, as noted by Forbes herself, using five year periods she inevitably focuses on the short and medium-term relationship between inequality and growth within individual countries. In this sense, her results do not necessarily contradict those obtained in the traditional cross-sectional literature, where taking averages over three decades implies a focus on the long-run relationship between the two variables across countries. Fifth, a more general criticism is that the DS criteria are too restrictive and imply an unnecessary drop in the number of available observations (Atkinson and Brandolini, 1999).

[12] For the sake of the discussion, she also obtains a negative and significant coefficient on GDP and on the proxy for market distortions PPPI, a positive and significant coefficient on EDUF and an insignificant coefficient on EDUM.

In spite of these caveats, it is clear that these recent empirical findings do represent an innovation relative to the widespread agreement that results from cross-sectional literature. Then the question is whether the theory could account for a positive relationship between inequality and growth. In fact, Saint Paul and Verdier (1996) elaborate some theoretical argument essentially based on political-economic considerations to sustain that inequality is not necessarily harmful for growth.

A first possibility is that more unequal societies effectively undertake more redistributive policies, but redistribution does not reduce economic growth. This positive link between redistribution and growth (rather commonly reported in the empirical literature) can arise in a model where inequality generates socio-political instability and widespread crime, which in turn reduce capital accumulation and hence constraint future economic growth. Redistributive polices, by reducing the gap between the large group of poor and the small elite of rich, would disincentivate radical protests and favour peaceful (regular) alternation in office of different constituencies. At the same time, these policies would also bribe poor people out of illegal activities, thus generating a more favourable climate for private entrepreneurship and investments. Redistribution can also benefit economic growth in a capital market imperfections framework where poorer individuals are liquidity constrained. Transfers would allow them to undertake investments (i.e. human capital accumulation) that engine growth. Similarly, if a large fraction of individuals cannot invest in education, then redistribution that goes through public education certainly has growth-promoting effects. Finally, at some stage of development, a condition for economic growth is the existence of a strong aggregate demand for a broad range of manufactures. Wealth redistribution can help creating this condition, especially in countries where there is no middle class.

The theoretical idea that redistribution is positive for growth does receive some empirical support (as previously noted and as it can be seen from Table 2). However, even rejecting this hypothesis, one can account for a positive link between inequality and growth by constructing an argument where the degree of redistributive policies undertaken in a country is inversely correlated to income inequality. Again, there is some evidence that this might indeed be the case (see Table 2). Saint Paul and Verdier (1996) develops two theoretical argument to sustain this point. One is based on the idea that political participation is endogenous. Richer voters are probably better organised and more interested in politics than poorer voters. This implies that the participation rate of the richer is higher and therefore that the endowment of the pivotal voter is greater than the median endowment. In this sense, using the median voter theorem to identify the social choice of the tax rate would be misleading and unequal societies would not necessarily be associated to higher redistributive taxation. The other argument is that a positive link between inequality and redistribution is obtained under the assumption that any mean preserving spread in income distribution will increase the

skewness of the distribution. This in turn reduces the median/mean ratio and the level of taxation preferred by the median voter. But, there is simply no theorem that says that skewness will systematically increase for any mean preserving spread. Related to this point is the observation that the median/mean ratio works well as a determinant of the tax level only if taxes are proportional. But in the real world, consistent elements of progressivity characterise tax systems, so that the chosen tax rate might be lower than what the median/mean ratio would suggest.

To conclude, there are sound theoretical reasons why inequality and growth might not be negatively correlated. Certainly, if redistribution is negatively related to inequality and growth is positively affected by redistribution, then the final prediction that inequality reduces growth would still hold. But clearly the transmission mechanism would be different from those traditionally considered in the literature. Furthermore, the new econometric evidence suggests that, at least within individual countries, the short and medium-term relationship between inequality and growth might be positive. All this calls for more research (both theoretical and empirical) in this area.

Section 3. A new research frontier: special interest politics and economic growth.

3.1 An overview of theoretical contributions

A classical example of special interest politics is lobbying through payments of campaign contributions to political parties. Persson and Tabellini (2000) develop a model where lobbying is detrimental to growth via its effect on sectoral allocation of resources. They consider an economy where all individuals have the same initial endowment of resources, but only a proportion $\alpha < 1$ of total population owns a fixed factor (land). Investment can be directed to either of two sectors. The first is an innovative sector where production takes place according to a AK technology and does not require use of the fixed factor. The second is a traditional sector where the production function exhibits constant returns to scale and does require use of the fixed factor in addition to capital. Investment decisions depend on the tax rate of output in the two sectors. A discriminatory fiscal policy is defined as the application of different tax rates in the two sectors. The rent that landowners receive from land is greatar the higher the tax rate in the new sector relative to the tax rate in the traditional sector. To obtain such a discriminatory sectoral taxation, landowners pay campaign contributions to political parties. Parties are assumed to have a purely electoralist motivation and the probability for a party to win the election is increasing in the amount of contributions received. To receive contributions, parties must commit to the implementation of a discriminatory fiscal policy once in office. Since campaign contributions will be effectively paid only to the party that

commits to the highest level of discrimination, policy platforms will converge to the same tax gap. Assuming that commitments are always maintained, the result is that the new sector is effectively taxed more than the traditional sector. This in turn drives resources away from the innovative sector towards the traditional sector and reduces aggregate investment and growth.

The model of Persson and Tabellini (2000) is based on the crucial assumption that capitalists (those individuals that do not hold any land) cannot pay campaign contributions or, more generally, that landowners are a better organised constituency, with tighter connections to the political system. This assumption does no seem to be implausible. As a matter of fact, it is often observed that lobbies linked to traditional sectors in an economy have considerable more say in domestic politics than lobbies linked to emerging sectors. A second important feature of the model is that parties are purely electoralist. That is, they are willing to change their policy platform in order to maximise campaign contributions received from landowners. A possible alternative assumption is that parties have ideological preferences that they try to implement once in office. Tabellini and Alesina (1990) and Alesina and Tabellini (1991) show that when combined with high government turnover, ideological differences between parties competing for office can lead to disproportionate accumulation of debt. This result can then be used to provide a link between ideology, political instability and growth. Given the intertemporal budget constraint of the government, excessive accumulation of debt will result in future higher capital taxation and hence lower economic growth. Such an extension therefore provides a theoretical explanation of why political instability (defined by the turnover in office rather than social distress) negatively affects economic growth.

Aghion and Bolton (1999) propose a model of special interest politics that incorporate the same basic idea of Persson and Tabellini's model. However, they focus more explicitly on innovation rather than sectoral allocation of resources. In their framework, innovation is a main engine of the process of economic growth. The adoption of the most innovative technologies is however a political decision made by workers and entrepreneurs of different generations. If constituencies linked to traditional sector are able to influence political decisions, then innovation is not permitted. This in turn reduces economic growth, with further adverse effects on investment in research and development. A possible outcome is thus a growth trap. Alternatively, the political cycle could generate an economic cycle, where periods of technology adoption and fast growth are followed by protection of traditional sectors and decline.

Another important instance of special interest politics which has received considerable attention in the political economy literature is the "common-pool problem". This can be defined as the excessively high levels of public spending that result from a weak budget process. In coalition governments, spending decisions are often decentralised at departmental level and each party in the

coalition is *de facto* free to set public spending on its favoured target (i.e. provision of a specific public good that is most preferred by the party's supporting constituency). Velasco (1999) and Drazen (2000) show that when government revenues are regarded by parties in the government as a common-pool with free access, then spending proposals are significantly larger than what would be optimal from the point of view of a social planner that maximise the concave utility function of a generic individual. This is because each party internalises only a fraction (decreasing in the number of parties in the coalition) of the cost of distortionary taxation that must be levied to finance higher current spending (or to repay debt in the future). As in the "Tragedy of the Commons" (Tornell and Velasco, 1992), the problem thus arises from the non co-operative behaviour of the decision makers. If spending decisions were centralised in the hands of a strong Minister of Finance or parties could take commitments to negotiated fiscal targets (that is, if the budget process were strong), then the cost of spending would be fully internalised by the actors participating into budget formation and the benevolent social planner outcome would be achieved.

The common-pool problem is clearly relevant for economic growth. The excessive spending that results from the appropriative strategies undertaken by parties in the coalition implies higher taxation (to cover the extra-spending, if the government cannot run a deficit and hence the tax rate is set residually, or to repay debt, if the government can run a deficit and debt must be paid back in the future). To the extent that this taxation disincentivates capital accumulation, the growth is lower than what it would be in a co-operative equilibrium (see also Persson and Tabellini, 2000, Chapter 14).

3.2 A simple econometric exercise: the impact of government fragmentation on economic growth

To assess the empirical relevance of special interest politics, I undertake an empirical test of the prediction generated by the common-pool model. The argument has been extensively tested with respect to fiscal policy formation (see Perotti and Kontopoulos, 1999 and Carmignani, 2000 for recent examples). Following the seminal work by Roubini and Sachs (1989), the strategy adopted in the literature is to regress a fiscal policy variable (size of deficit or change in the government spending to GDP ratio) on a set of control variables and an indicator of the degree of dispersion of political power within the government. Almost all contributions in this area measure dispersion as a function of the number of parties in the government or the number of portfolios in the cabinet. That is, more dispersed governments are assumed to be those numerically more fragmented. However, a closer inspection of theoretical models reveals that a necessary condition for the common-pool problem to arise is that parties in the coalition must represent different economic interests and hence

they must have different preferences over the composition of public spending (or the provision of public goods). Thus, it is not just the numerical fragmentation of the government that matters, but also its degree of ideological fragmentation. Carmignani (1999 and 2000) proposes to measure the ideological heterogeneity of coalition partners by the statistical dispersion of the ideological locations on a ten point Left-Right policy scale of parties in the coalition.[13] I will make use of this measure (labelled CI) in the econometric analysis that follows. The theoretical proposition to be tested is thus that CI is negatively correlated with economic growth after controlling for economic and environmental variables.

The growth regression which is estimated is specified as:

$$(1.8) \qquad g_i(t) = a + \mathbf{X}_i(t) + CI_i(t) + SHARE_i(t) + e_i(t)$$

where *i* denotes country and *t* denotes time, *g* is the average rate of growth of per-capita income (source: Summers and Heston, 1991), **X** is a set of control variables (to be specified below), *CI* is the index of ideological fragmentation of the coalition (source: Carmignani, 1999), *SHARE* is the share of seats controlled by the government and ε is an error term (source: Carmignani, 1999).

As discussed in Section 1, estimation of equation (1.8) involves a few methodological problems. First is the choice of the appropriate estimation method. Under the assumption that disturbances are identically and independently distributed with zero mean and finite variance, then a pooled OLS estimator is consistent. However, to permit unobservable country-specific heterogeneity, the constant term can be decomposed into an economy-specific and time-specific effect. Then, usual fixed and random effect estimators can be used. However, if the set of control variables **X** includes income at time *t-1* then the models includes a lagged endogenous variable (as discussed in Section 2) and hence both the random and the fixed effect estimators might be biased. Furthermore, the small size of the sample (see below) implies that the alternative unbiased estimator proposed by Arellano and Bond (1991) cannot be used here because it would produce too small standard errors. In the end, I will estimate the model using both the pooled OLS and the factor models (random and

[13] Ideological locations of individual parties are taken from the Left-Right empirical policy scales commonly available from the applied political science literature (e.g. Huber and Inglehart, 1995). Details on the construction of such scales can be found in Laver and Schofield (1990, Appendix B). In these scales, each party is assigned a cardinal location (a number) that represents its ideology. Normally, scales are defined on a ten point interval, with 1 representing extreme-left and 10 extreme-right. If *n* is the number of parties in the coalition and θ_i is the cardinal location of generic partner *i*, then the index of ideological heterogeneity is defined as:

$$\text{CI} = \frac{n\sum_{i=1}^{n} q_i^2 - \left(\sum_{i=1}^{n} q_i^2\right)}{n(n-1)}$$

fixed effect). I apply the Hausman test (Hausman, 1978) to discriminate between the random and the fixed effect and then report the results from pooled OLS as a point of comparison. I also perform sensitivity analysis by estimating the model with and without the per-capita income at time *t – 1* among the set of regressors.

The second problem relates to the choice of the control variables. Given the results reported by Sala-i-Martin (1997) and Ley and Steel (1999) and taking into account the peculiar nature of the sample (see below), I choose a parsimonious specification that includes: the log of per-capita income in period $t - 1$ ($GDP_i(t-1)$), the level of male and female human capital in period t ($EDUM_i(t)$ and $EDUF_i(t)$ respectively) and the growth rate of population in period t ($POP_i(t)$). $EDUM_i(t)$ and $EDUF_i(t)$ are proxied by the log of the average years of secondary schooling in the male and female population aged above 25. $POP_i(t)$ is instead intended as a proxy for the growth rate of labour force.[14] This basic specification is then extended to include physical capital accumulation ($INV_i(t)$), defined as the investment to GDP ratio in period t. The basic specification is very similar to the one adopted by Forbes (2000), whilst the one with the investment ratio is analogous to the "reduced form" of the structural model in Benhabib and Spiegel (1997). Furthermore, I perform additional sensitivity analysis of the results on the political variables by re-estimating the model with different combinations of the economic variables.

A third issue concerns the availability of political data. The computation of the index CI that I use to measure the degree of ideological fragmentation requires information on the ideological location of individual political parties. Reliable and cross-country comparable information of this type is not available for many countries, especially before mid 80's. The series of political indicators constructed by Carmignani (1999) go back to 1945, but include only the group of western European countries. Given that Greece, Portugal and Spain were not democratic regimes for a fraction of post-war era, that the UK never experienced coalition governments (and hence should not be included in the test of a theoretical proposition that explicitly concerns coalition systems) and that for Iceland and Luxembourg time-series of economic and education data are incomplete, the number of countries on which the analysis can be conducted shrinks to 11 (Austria, Belgium, Denamrk, Finland, France, Germany, Ireland, Italy, the Netherlands, Norway and Sweden). Moreover, Barro and Lee's data on education are available only as five year averages and for the period 1960-1990. This represents a constraint on the choice of my sample period and the frequency

[14] The sources of data are: Summers and Heston (1991) for GDP and INV and Barro and Lee (1993) for EDUM, EDUF and POP.

of observations. All in all, a total of 66 observations are available for estimation: 6 for each of the 11 countries.

A final point concerns the inclusion of the variable SHARE on the r.h.s. of the growth equation. It is possible that more fragmented coalitions are also numerically very large. Thus, if the model includes variable CI only, then the estimated coefficient on CI is likely to capture both a "fragmentation effect" and a "coalition size effect" on growth. Given that the coalition size effect might be large and of sign opposite to the one expected for CI (see Darby et al. 2000), it is adviceable to isolate it using the simple variable SHARE.

Econometric results are reported in Table 3. For both model specifications two sets of estimates are displayed: those obtained from either fixed effects or random effects (depending on which of the two is favoured by the Hausman test) and those obtained from the pooled OLS. At the bottom of the table, the value of the Hasuman test statistics and the associated p-value are also reported. To interpret these statistics consider that high values of the test statistic favour the fixed effect model.

The first column refer to the estimation of the growth regression (1.8) without the investment ratio on the r.h.s. The Hausman test favours the random effect model. The negative and statistically significant coefficient on CI is consistent with the theoretical prediction generated by the common-pool argument: the ideological fragmentation of the coalition negatively correlates with economic growth. Intuitively, the direction of the casual relationship should go from fragmentation to growth. Poor economic performance can determine the duration of the government and eventually its ideological orientation, but it is difficult to construct a solid theoretical argument to sustain that growth affects fragmentation. However, to account for possible joint endogeneity, I re-estimated the growth equation using lagged values of CI as instruments. The coefficient on CI remains negative and significant at usual confidence levels.

The positive coefficient on SHARE implies that when fragmentation is kept constant, numerically larger governments are able to generate higher growth. This effect might be a consequence of the higher stability of governments that build on a larger parliamentary basis (as suggested by Darby et al., 2000). Of the economic variables, only GDP displays a coefficient statistically different from zero. Possibly, EDUM and EDUF do not exhibit enough variation in my sample. However, using other measures of education contained in the Barro and Lee data-set does not produce any relevant change. Similarly, dropping EDUM and EDUF does not alter the results on the political variables. The inclusion of other control variables (such as the government spending to GDP ratio, trade policy variables and life expectancy) has no relevant effect on the coefficient of CI. Finally, the random effect estimates of the coefficient on CI when initial GDP is dropped from the r.h.s. of the model are identical to those reported in Table 3.

In the second column, the growth equation includes the investment ratio. INV displays a positive and significant coefficient (as one would expect) and results on the other economic variables do not qualitatively change from those in the first column. Interestingly, the coefficient on CI still passes a zero restriction test. Thus fragmentation affects the level of efficiency; that is, its effect on growth "goes above and beyond its effect on the incentives to invest". This means that in addition to the mechanism incorporated in the basic common-pool problem, other channels could exist that link the growth performance of a country to the structure of its government. Investigation of such channels is certainly a promising avenue of future research.

4. Concluding remarks

Three major advances in the political economy literature on economic growth have been investigated in this paper. The first one is an econometric issue. Most of the empirical results on the political determinants of growth are obtained within the traditional framework of Barro's type cross-section regressions. Some of the weaknesses of this framework have been recently pointed out. I focused attention on the problems of omitted variables and model uncertainty. Although not immune from shortcomings, panel data estimation methods represent the obvious way out to most of the drawbacks of cross-sectional regressions. Interestingly, results on the empirical relevance of political variables obtained from cross-section estimation might be significantly different from those obtained from the estimation of panel models.

The second point which has been considered concerns the relationship between initial inequality of income and wealth distribution and subsequent economic growth. Recent empirical findings (obtained using high-quality data in panel models) show that the "common belief" that this relationship is negative might not be true, at least within individual countries. This calls for a re-consideration of some political economy theories that predict a positive effect of inequality on growth.

The third major advance I have surveyed relates to the role of special interest politics in determining growth. By favouring the implementation of discriminatory sectoral tax policies, the lobbying activity of individuals linked to traditional sectors of the economy might drive resources away from innovative sectors and hence reduce growth in a framework where innovation is its main engine. Another instance of special interest politics is the "common-pool problem", which characterise spending decisions in coalition (fragmented) governments. The empirical relevance of the common-pool argument for fiscal policy formation has been rather extensively tested. I have extended the econometric analysis to study the impact of ideological fragmentation on growth. Results show that

more ideologically heterogeneous coalitions are associated to lower growth rates after controlling for some economic and environmental variables (including the investment to GDP ratio).

As noted in the paper, panel and time-series analysis are sometimes constrained by the limited availability of data. Similarly, the implementation of econometric tests using more sophisticated political indicators (such as the one used in Section 3) is currently possible only for a relatively small sample of industrial countries. Future applied research will certainly benefit from the longer span of economic and political data that progressively become available. On a more theoretical ground, the investigation of the channels through which special interest politics affects growth is a promising avenue of future work. For instance, coalition governments are certainly subject to the pressure of interest groups with different policy preferences. This heterogeneity of interests is at the basis of the common-pool problem. However, the empirical analysis in Section 3 shows that in addition to its effect on the incentive to invest, political fragmentation might alter the "level of efficiency" in the economy (or, perhaps the incentive to invest in alternative forms of capital) A formalisation of this additional link would clearly be worthwhile, given the attention that technological efficiency receives in the growth literature.

Appendix

A1. *Variables definition*

g	*Growth rate of per capita GDP*. Source: Summers and Heston (1991)
GDP	*Log of per-capita income*. Source: Summers and Heston (1991)
EDUM	*Log of average years of secondary schooling of male population*. Source: Barro and Lee (1993)
EDUF	*Log of average years of secondary schooling of male population*. Source: Barro and Lee (1993)
POP	*Rate of growth of population.* Source: Barro and Lee (1993)
INV	*Average investment to GDP ratio.* Source: Summers and Heston (1991)
CI	*Ideological fragmentation of the coalition* (see footnote 13 for details). Source: Carmignani (1999)
SHARE	*Share of seats held by the ruling coalition.* Source: Carmignani (1999).

A2. *Table 1: Summary of cross-sectional empirical evidence on political determinants of growth* (see end of the table for explanatory notes; the table also reports some panel studies that have been explicitly mentioned in the text).

Political Variable	Reference	Variable definition	Finding[a]
Level of democracy	Kormendi and Meguire (1985)	Dummy based on Gastil's index of civil liberties	No relationship
	Marsh (1988)	Gastil's index of civil liberties and political rights	No relationship
	Barro (1991)	Gastil's index of political rights	Positive relationship, but only in some model specifications
	Levine and Renelt (1992)	Gastil's index of civil liberties	No robust relationship
	Barro and Lee (1993)[b]	Gastil's index of civil liberties and political rights	No relationship

A2. *Table 1: Summary of cross-sectional empirical evidence on political determinants of growth* (continued)

Political Variable	Reference	Variable definition	Finding
Level of Democracy	Helliwell (1994)	linear transformatio of Gastil's index of political rights and civil liberties	No relationship
	Barro (1994)[c]	Gastil's index of political rights	inverted U relationship (statistically significant)
	De Haan and Siermann (1995)	Dummies based on Gastil's index of political rights	No relationship
	Sala-i-Martin (1997)	Knack and Keefer (1995) index of civil liberties, Gastil's index of political rights, Knack and Keefer (1995) aggregate index of democracy	Robust relationship for index of civil liberties, index of political rights No robust relationship for the aggregate index of democracy
	Ley and Steel (1999)[d]	same as Sala-i-Martin (1997)	none of the variables is an "important" determinant of growth
Initial inequality of income and land distribution	Persson and Tabellini (1994)	Share in personal income of the top 20% of the population and income share accruing to the third quintile	negative relationship in the historical sample; negative relationship for democracies in the post-war sample no relationship for non-democratic countries in the post-war sample
	Alesina and Rodrik (1994)	Gini coefficient on income and land distribution	Negative relationship
	Alesina and Perotti (1994)	Gini coefficient on income and land distribution	Negative relationship

A2. *Table 1: Summary of cross-sectional empirical evidence on political determinats of growth* (continued)

Political Variable	Reference	Variable definition	Finding
Initial inequality of income and land distribution	Keefer and Knack (1995)	Gini coefficient on income and land	Negative relationship
	Perotti (1996)	Share in income of the third and fourth quintile	Negative relationship, not robust to the inclusion of regional dummies
	Benhabib and Spiegel (1997)[e]	High quality data on income and land Ginis[f]	No relationship
	Deininger and Squire (1998)	High quality data on income and land Ginis[f]	Negative relationship, not robust to the inclusion of regional dummies
	Forbes (2000)[e]	High quality data on income and land Ginis[f]	Positive relationship
Political instability, political violence, war	Barro (1991)	Average number of revolutions and coups	Negative relationship
	Barro (1991)	Assassinations	Negative relationship
	Levine and Renelt (1992)	Average number of revolutions and coups	No robust relationship
	Easterly and Rebelo (1993)	Assassinations and war casualties	No relationship
	Barro and Lee (1993)[b]	dummies for war and war time	No relationship
	Barro and Lee (1993)[b]	Revolutions, assassinations and war casualties	Negative relationship
	Mauro (1995)	Institutional and social stability [f]	negative relationship in most specifications

A2. *Table 1: Summary of cross-sectional empirical evidence on political determinants of growth* (continued)

Political Variable	Reference	Variable definition	Finding
Political instability, political violence, war	Alesina and Perotti (1996)[g]	Index of Socio-political instability[h]	Negative relationship
	Perotti (1996)	Index of Socio-political instability[h]	Negative relationship
	Alesina, Ozler, Roubini and Swagel (1996)	Estimated probability of government transfer	negative relationship in most specifications
	Benhabib and Spiegel (1997)[e]	Dummy variable for major government transfers	No relationship with growth, negative relationship with physical capital accumulation
	Sala-i-Martin (1997)	War dummy, revolutions and coups, political assassinations, ethnolinguistic fractionalisation	negative relationship for war dummy and revolutions and coups when investment ratio is not included as a regressor
			No robust relationship for political assassinations and ethnolinguistic fractionalisation
	Ley and Steel (1999)[d]	same as Sala-i-Martin (1997)	only ethnolinguistic fractionalisation is an "important" determinant of growth
	Fielding (2000)[i]	Casualties due to the *Intifada*	Negative relationship with physical capital accumulation.
Bureaucratic inefficiency and rule of law	Mauro (1995)	Subjective indicators of bureaucratic inefficiency and corruption[l]	Negative relationship in some specifications.

A2. *Table 1: Summary of cross-sectional empirical evidence on political determinants of growth* (continued)

Political Variable	Reference	Variable definition	Finding
Bureaucratic inefficiency and rule of law	Keefer and Knack (1995)	Subjective indicators of quality of bureaucracy and rule of law[l]	negative relationship, significance depends on model specification and source of subjective indicators
	Sala-i-Martin (1997)	Rule of Law (from Keefer and Knack, 1995)	negative and robust relationship (low rule of law determines low growth)
	Ley and Steel (1999)[d]	Rule of Law (from Keefer and Knack, 1995)	rule of law is an "important" determinant of growth.

[a] Finding refers to the relationship between the political variable and economic growth, independently from how the variable is defined. So, for instance, Persson and Tabellini (1994) use the income share accruing to the third quintile as a measure of equality (rather than inequality). They obtain a positive estimated coefficient on this measure of equality, which implies a negative relationship between inequality and growth. The reported finding is "negative relationship".
[b] Estimate a pooled cross-section time series using instrumental variables.
[c] Estimates a system of three equations using 3SLS. Each equation refers to a fraction of total sample period.
[d] Important determinants of growth are those whose posterior probability is above 0.8 (see Section 1). Not important regressors are those whose posterior probability is below 0.2. This is the case for war dummy and revolutions and coups. Political rights ad civil liberties are instead in the intermediate group of regressors whose posterior probability is smaller than 0.8, but larger than 0.2.
[e] Estimate panel models.
[f] Taken from the data-set constructed by Deininger and Squire (1996).
[g] Dependent variable is the investment ratio. Authors estimate a system of two simultaneous equations (see Section 2).
[h] Obtained from principal components analysis of data on assassinations, political death, coups and democracy.
[i] Cointegration analysis (see Section 1)
[l] Indicators supplied by private firms that evaluate country-risk as a part of their business (see also Brunetti, 1997 for a description of these indicators).

A3. *Table 2: Summary of the evidence of the relationship between inequality and growth*

Relationship	Reference	Finding
Initial income inequality on subsequent growth	see Table 1	see Table 1
Initial income inequality on degree of redistribution	Easterly and Rebelo (1993)	positive relationship
	Keefer and Knack (1995)	negative, but not statistically significant relationship

A3. *Table 2: Summary of the evidence of the relationship between inequality and growth* (continued)

Relationship	Reference	Finding
Initial income inequality on degree of redistribution	Perotti (1996)	positive, but not significant relationship
	Lindert (1996)	negative relationship (not significant if redistribution is measured as the share of education spending in GDP)
Redistribution on growth	Sala-i-Martin (1992)	positive relationship
	Easterly and Rebelo (1993)	not significant relationship
	Perotti (1996)	positive relationship
	Lindert (1996)	positive relationship
Initial income inequality on political instability, social distress, political violence	Gupta (1990)	positive relationship
	Keefer and Knack (1995)	positive relationship
	Perotti (1996)	positive relationship
	Alesina, Ozler, Roubini and Swagel (1996)	positive relationship
Political instability on growth	see Table 1	see Table 1
Credit market imperfections on growth	Perotti (1992)	negative relationship
	Benhabib and Spiegel (1997)	negative relationship (not significant when using an interactive term of credit market imperfections and income inequality).

A4. *Econometric results*

Regressors	*Column 1*		*Column 2*	
	Panel	Pooled OLS	Panel	Pooled OLS
GDP	-.027756 (.005824)	-.027382 (.005201)	-.027389 (.007218)	-.025693 (.005248)
EDUM	.012584 (.024721)	.011636 (.022067)	.012267 (.029588)	.009169 (.021852)
EDUF	-.005971 (.019842)	-.005341 (.017591)	-.005745 (.024158)	-.004092 (.017392)
POP	.071248 (.441338)	.041317 (.412800)	.009844 (.498325)	-.118935 (.420216)
INV			.039141 (.019263)	.045306 (.018763)
CI	-.006473 (.003101)	-.006453 (.003065)	-.006542 (.003684)	-.006745 (.003033)
SHARE	.0332604 (.020579)	.033792 (.019077)	.032958 (.022794)	.0356478 (.018879)
Hausman test-stat (p-value)	1.97 (.922876)		2.16 (.950324)	

The growth rate is per-capita income. Standard errors are in brackets. The sample includes 66 observations. The Huasman test always favours the Random effect estimator over the Fixed effect estimator.

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