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DOES POLITICAL STRUCTURE REALLY MATTER? EVIDENCE ON POLITICAL STRUCTURE, FINANCIAL DEVELOPMENT AND ECONOMIC GROWTH

Alun Dwyfor Evans, Bank of America,
Christopher Green, Economics Dept, Loughborough University and
Victor Murinde
Birmingham Business School
University of Birmingham

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Does Political Structure Really Matter?
Evidence on Political Structure, Financial Development and Economic Growth?

by

Alun Dwyfor Evans, Bank of America

Christopher J. Green, Department of Economics, Loughborough University

Victor Murinde, The Birmingham Business School, University of Birmingham; and Institute for Development Policy and Management (IDPM), University of Manchester

Correspondence to:
Victor Murinde
The Birmingham Business School
The University of Birmingham
Edgbaston
Birmingham B15 2TT
United Kingdom
Tel: 0121-414-6704
Fax: 0121-414-6238
E-mail:V.Murinde@bham.ac.uk

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Does Political Structure Really Matter?
New Evidence on Political Structure, Financial Development and Economic Growth

Abstract

This paper investigates the importance of political structure in economic growth, within a broad framework that incorporates financial and human capital variables. A growth model, based on a translog production function and augumented with variables that underpin key hypotheses on political structure, is estimated and tested using a comprehensive panel of 82 countries over 21 years. The main findings of the study are threefold. First, the results suggest that politically open economies (in terms of political rights and civil liberties) experience faster rates of per capita growth than authoritarian regimes. Second, it is found that all definitions of military conflict impart a deleterious influence on economic growth. Third, in addition to political structure, financial and human capital play an important role in economic growth. The implications of this study are that political structure really matters for economic growth, and deserves as much attention as finance and human capital do.

JEL Classification: A12, H11, O11, O57

Keywords: Political structure, financial development, economic growth, translog production function

1. Introduction

A widely shared experience by policy makers is that many developing countries notoriously suffer from poor governance and considerable social and political instability. It would appear that the prospects for high economic performance under such conditions are bleak. For example, Lensink, Niels and Murinde (2000) find robust evidence that political risk leads to capital flight and negatively affects economic growth by depriving the domestic economy of the essential capital.

In general, in terms of political economy, the theory on the relationship between political structure and economic growth comprises three schools of thought. According to the "conflict perspective" school, full political and civil rights are incompatible with economic growth. However, the "compatibility perspective" view is that political liberty is positively related to economic development. The "sceptical perspective" school rejects the existence of any relationship between political structure and economic growth. With respect to the first two schools, the literature suggests that differences in political environments affect countries' economic performance via the following channels: strength of nationhood; degree of continuity in political leadership; administrative competence of government; and general stance of economic policy. See Evans (1997) and Siermann (1998).

The empirical literature on these issues is divided.[1] In addition, the literature has been largely criticised in surveys by Sirowy and Inkeles (1990) and de Haan and Siermann (1994). The basis of these criticisms derive from specification issues underlying the measurement of political regimes,

[1] Political liberals propose that increased political and civil rights foster improved rates of economic growth. Others scholars, however, claim that economic success in certain regions is due to the political stability created by authoritarian regimes. However, some countries have progressed substantially under military rule, as in South Korea, while in some countries military rule has debauched the economy, as in Argentina, Ghana and Nigeria. The IMF (1994) argues that in Africa, for instance, political instability in itself is sufficient to explain mediocre economic performance, but as seen in Nepal stability does not necessarily provide any guarantee of growth.

particularly where these measures take the form of dummy variables. There exists dissatisfaction that proxies for political systems may not adequately measure their strict relevance to economic factors. Moreover, results have been found to be sensitive to the use of cardinal or dichotomous dummy variables. In addition, there exists general dissatisfaction at the atrophy of robustness analysis in empirical studies.

This paper aims to empirically test the validity of the three contrasting views, within an overall theoretical framework for economic growth. The main contributions of this paper are threefold. First, the paper explores the functional form of an appropriate model for economic growth and experiments with the most effiecient ways of estimating it; specifically, Cobb-Douglas and translog functional forms are estimated in cross-section and panel data formats. Second, standard estimating models are augmented to include the effects of different political regimes and region specific parameters in a way that overcomes the limitations of previous studies. A host of political variables are applied, many of which deliberately attempt to replicate past studies by drawing heavily from the political ranking of economies as measured by the Comparative Survey of Freedom project. Third, measures are proposed to test the implications of military conflict on economic growth.

The rest of this paper proceeds as follows. In Section 2, Cobb-Douglas and translog functional forms of a simple production function are used to generate a simple growth model, which is then augumented with surrogates for political structure. The data and econometric methodology are outlined in Section 3, paying particular attention to past specifications of political variables. The empirical results are described in Section 4. Section 5 concludes.

2. The model

We invoke an overall theoretical framework for economic growth in order to tease out the impact of political structure, given that there are other important factors that are traditionally known to influence the process of economic growth; for example, human capital and finance. The baseline specification we consider is a Cobb-Douglas production function that allows for externalities to human capital and real balances:

$$Q_i = AK^{?}_i L^{?}_i HC^{?}_i RB^{?}_i ?_i \qquad (1)$$

where i denotes country ($i = 1, \ldots, n$); Q is output; A is an overall efficiency factor and includes the level of technology; K is capital stock; L represents labour force; HC corresponds to human capital; RB is real balances; and $?$ is a stochasic term which is unobservable and is assumed to be serially uncorrelated and normally distributed with a zero mean and unit variance.

Each variable is transformed to determine its rate of growth. First, all variables are expressed in natural logarithms:

$q_{it} = log\ Q_{it},\ k_{it} = log\ K_{it},\ l_{it} = log\ L_{it},\ hc^{x}_{it} = log\ HC^{x}_{it}, rb^{x}_{it} = log\ RB^{x}_{it.}$

where superscript x denotes distinct human capital and real balances variables. Differentiating each factor with respect to time presents a function that is linear in the the rates of change:

$$\frac{dq_i}{dt} ?? _1 \frac{dk_{iit}}{dt} ?? _2 \frac{dl_{iit}}{dt} ?? _3 \frac{dhc^{x}_i}{dt} ?? _4 \frac{drb^{x}_i}{dt} \qquad (2)$$

By extending the baseline model in (1) and (2) to allow for interactions among factor inputs, we obtain a translog production function, which enables a richer specification of the relationships

among growth and factor inputs than the Cobb-Douglas function.[2] Specifically, we use a general translog function, following Berndt and Christensen (1972):

$$q_{nt} ? ?_{0n} ? \sum_{i} ?_{in} v_{int} ? 0.5 \sum_{i} \sum_{j} ?_{ijn} v_{int} v_{jnt} \qquad (3)$$

where q_{nt} ? log of aggregate output in country n (= 1,...,N) at time t (= 1,...,T); v_{int} ? log of the i'th (i = 1,...,I) factor input in country n at time t; $?_{in}$, $?_{ijn}$ are the parameters of the production function.

We convert (3) into *per-capita* terms by subtracting the (log of) labour input (which we take to be v_4) and defining: y_{nt} ? log of output per unit of labour in country k at time t; and f_{int} ? log of the i'th factor input per unit of labour (i = 1,...,3) in country n at time t.

We then derive:

$$y_{nt} ? ?_{0n} ? \sum_{i} ?_{in} f_{\text{int}} ? 0.5 \sum_{i} \sum_{j} ?_{ijn} f_{\text{int}} f_{jnt} \qquad (4)$$

on the assumptions that:

$$\sum_{i} ?_{in} ? 1; \qquad ?_{44n} ? \sum_{i?1}^{3} \sum_{j?1}^{3} ?_{ijn}; \qquad ?_{4jn} ? ? \sum_{i?1}^{3} ?_{ijn}; \qquad n = 1,...,N$$

which are sufficient for (3) to exhibit constant returns to scale. We impose these assumptions primarily to facilitate comparison with more traditional models, which are implicitly or explicitly based on the Cobb-Douglas approach. Although equation (4) is technically equivalent to constant returns to scale in (3),[3] we do not regard this as restrictive, because we explicitly include in the model produced factors other than physical capital, ie: human capital and money. The inclusion of human capital is consistent with the endogenous growth theory, as we later explain. The monetary

[2] We try to address the criticism that existing studies which employ the Cobb-Douglas specification ignore factor input cross-substitution possibilities. We believe this is a valid criticism given the likely interaction between say, physical and human capital.

[3] It is therefore equivalent to Kmenta's (1967) proposed approximation to the CES.

variable is inspired by the theory on "money in the production function", but it also has the potential for interacting with other inputs (say capital) in the context of the McKinnon-Shaw complementarity hypothesis and debt intermediation view. Finally, we form a growth rate regression, by differentiating (4) with respect to time, and adding a disturbance term, to obtain:

$$?y_{nt} \; ? \; ?_{0n} \; ? \sum_i ?_{in} ? f_{\text{int}} \; ? \sum_i \sum_j ?_{ijn} ? f_{\text{int}} f_{jnt} \; ? \; ?_{nt} \tag{5}$$

where $?y_{nt} \; ? \; y_{nt} \; ? \; y_{nt?1}$, etc.; $?_{nt}$ are the regression disturbances.

Given the advantage of the translog functional form in capturing factor interactions or substitution, the innovation we make here is to consider the significance of political parameters in the context of cross-substitution possibilities. The unrestricted translog model inclusive of political variables is expressed as:

$$\frac{\mathrm{d}y_i}{\mathrm{d}t} \; ? \; ?_1 \frac{\mathrm{d}k_i}{\mathrm{d}t} \; ? \; ?_2 \frac{\mathrm{d}hc_i^x}{\mathrm{d}t} \; ? \; ?_3 \frac{\mathrm{d}rb_i^x}{\mathrm{d}t} \; ? \; ?_{11} k_i \frac{\mathrm{d}k_i}{\mathrm{d}t} \; ? \; ?_{12} ?k_i \frac{\mathrm{d}hc_i^x}{\mathrm{d}t} ? hc_i^x \frac{\mathrm{d}k_i}{\mathrm{d}t} ?$$

$$?_{13} ?k_i \frac{\mathrm{d}rb_i^x}{\mathrm{d}t} ? rb_i^x \frac{\mathrm{d}k_i}{\mathrm{d}t} ? \; ?_{14} y72_i \frac{\mathrm{d}k_i}{\mathrm{d}t} \; ? \; ?_{15} pol_i^x \frac{\mathrm{d}k_i}{\mathrm{d}t} \; ? \; ?_{22} hc_i^x \frac{\mathrm{d}hc_i^x}{\mathrm{d}t} \; ?$$

$$?_{23} ?hc_i^x \frac{\mathrm{d}rb_i^x}{\mathrm{d}t} ? rb_i^x \frac{\mathrm{d}hc_i^x}{\mathrm{d}t} ? \; ?_{24} y72_i \frac{\mathrm{d}hc_i^x}{\mathrm{d}t} \; ? \; ?_{25} pol_i^x \frac{\mathrm{d}hc_i^x}{\mathrm{d}t} \; ? \; ?_{33} rb_i^x \frac{\mathrm{d}rb_i^x}{\mathrm{d}t} \; ?$$

$$?_{34} y72_i \frac{\mathrm{d}rb_i^x}{\mathrm{d}t} \; ? \; ?_{35} pol_i^x \frac{\mathrm{d}rb_i^x}{\mathrm{d}t} \; ? \; ?_{44} y72_i \; ? \; ?_{55} pol_i^x \tag{6}$$

where pol^x is a measure of political structure.

Thus, in terms of equation (6), seven main variables form the basis of the production function which we estimate: aggregate income; the four factors of production: labour, physical capital, human capital, and money; political structure and initial income. We include initial income because, as

Temple (1999) points out, direct differentiation of the production function eliminates initial conditions. This leaves the main problem as that of explaining the rate of technical change. Mankiw, Romer and Weil (1992) propose that this be done mainly by including human capital as a second produced factor. However, initial conditions do appear in the model by Mankiw, Romer and Weil (1992), because it is tied down by the inclusion of long-run equilibrium conditions. In our model, we include two produced factors: human capital and money; but we do not impose equilibrium conditions. Therefore, as long as each economy is operating on its production function, (3) could be estimated directly without reference to initial income. We nevertheless include initial income for two reasons. First, wherever possible, we are interested in comparing our model with previous studies which, irrespective of theoretical foundation, have invariably included initial conditions in order to examine the question of convergence. Second, although our specification includes, in principle, all relevant factors of production, given the difficulty, in practise, of measuring political structure, human capital and money, we would still anticipate that there may be variables omitted from the model. The nature of growth models is such that that omitted variables are an endemic problem in testing growth theory. There is a broad consensus that initial conditions are important for growth, even if the precise reasons for their importance are less well agreed (Evans, 1997; Temple, 1999). Insofar as initial conditions are important, then they are correlated with changes in factor inputs. Thus, in our model, initial conditions serve two purposes: first, to check for convergence, and second to capture any omitted factors of production. Of course, initial income is not itself a factor of production, but in this paper, we have treated it symmetrically with the factors of production, so as to allow for the possibility of interactions between the initial conditions and the changes in factor inputs.

Thus, the equation we estimate can be written more fully as:

$$
\begin{aligned}
?y_{nt} \;=\; & ?_{0n} + ?_{1n} ?k_{nt} + ?_{2n} ?h_{nt} + ?_{3n} ?m_{nt} + ?_{4n} y72_n \\
& + ?_{11n} ?k_{nt} ?k_{nt} + ?_{12n} ?k_{nt} ?h_{nt} + ?_{13n} ?k_{nt} ?m_{nt} + ?_{14n} ?y72_n ?k_{nt} \\
& + ?_{15n} ?pol_n ?k_{nt} + ?_{22n} ?h_{nt} ?h_{nt} + ?_{23n} ?m_{nt} ?h_{nt} + ?_{24n} ?y72_n ?h_{nt} \\
& + ?_{25n} ?pol_n ?h_{nt} + ?_{33n} ?m_{nt} ?m_{nt} + ?_{34n} ?y72_n ?m_{nt} \\
& + ?_{35n} ?pol_n ?m_{nt} + ?_{44n} ?y72_n pol_{nt} + ?_{nt}
\end{aligned}
\qquad (7)
$$

where k_{nt} ? physical capital per unit of labour; m_{nt} ? real money balances per unit of labour; h_{nt} ? human capital per unit of labour; $y72_n$? initial income per unit of initial of labour (1972). The exact empirical counterparts of these variables are defined in Section 3.

Equation (7) offers a relatively parsimonious parameterization of the model, with no more coefficients to estimate than is common in Barro regressions, and obviously fewer than in country-by-country estimations. Moreover, the quadratic terms give additional curvature to the function, and allow for a range of production possibilities, including individual country differences arising from the interaction terms. Since initial income is also included in the model, these individual country effects may also depend on initial conditions. After all, the use of panel data enables us to allow for further differences in the aggregate production function across countries in the form of unobservable individual country effects. See Islam (1995).

In general, therefore, an important innovation of this study is to estimate output growth with panel data and the translog functional form. It is conjectured that this specification is likely to represent the most rigorous examination of the underlying data as it considers both the total dataset and the interactive relationships between independent parameters. Clearly the translog offers more parameters than the Cobb-Douglas. Moreover, it has a specific advantage in the modelling of human capital. Several researchers have argued that the Cobb-Douglas is inappropriate for modelling the productive contribution of education in particular and human capital in general. See, *inter alia*, Bowles (1970), Klees and Wells (1977), Lau (1979) and Psacharopoulos and

Arriagada (1986). The point is that human capital is typically embodied in other factors of production; its effect therefore arises in large part through its interaction with these other factors, especially as factors are renewed: young workers enter the labour force, or old capital replaced. It would be better to analyse these effects with a more flexible functional form than the Cobb-Douglas, but, as far as we are aware, ours is the first analysis of the determinants of growth to take this point on board.

3. Data and econometric methodology

3.1 Political analysis data

We follow recent empirical studies which employ Gastil's ranking of countries as a proxy for political structure (see Table 1). Gastil has created two measures of political freedom. The first measure, *political liberty*, is based on the degree to which individuals have control over those who govern; the second, *civil liberty*, attempts to measure the rights of the individual. These Gastil measures of liberty have most frequently been applied as dichotomous variables, i.e. (0-1) dummy variables. Certain authors, e.g. Marsh (1988), Barro (1989) and Helliwell (1992), employ the variable as if the data were cardinal. This is criticised by de Haan and Siermann (1994) as "spurious cardinality", but is supported by Bollen (1990).

[Insert Table 1 about here]

Most of the empirical studies that apply Gastil's rankings begin their estimating sample period in the 1960's. Gastil's measurements are available from 1972 only. Given a likely positive relationship between income levels and democracy, using a measure of democracy from the middle or end of the sample period runs the risk that a possible negative effect of democracy on growth is masked by the reverse effect of income level on democracy (de Haan and Siermann, 1994).

Helliwell (1992) has countered this problem in two ways: firstly, by applying the Bollen-index of political democracy (available from the 1960's); and secondly, by using the Pourgerami (1988) index.

A further estimation issue is whether the characteristics (and ranking) of a political regime are measured at a single point in time (point measurement) or over a period of time (period measurement). Sirowy and Inkeles (1990) argue that measurement at a single point in time suffers from severe weaknesses, most notably that this method makes no allowances for subsequent changes in the character of a political regime. The longer the estimated time period, the more likely it is that this assumption will be violated. Most studies have tended to neglect this change over time (see Marsh, 1979, 1988; Meyer *et al*., 1979; and Weede, 1983a). In empirical estimation, "period measurement" is preferred as it considers democratic characteristics for exactly the same period for which the dependent variable is assessed.

Eight measures are applied as proxies for political structure and these incorporate political rights, civil liberties and periods of conflict. In this context, the present study differs from its predecessors in three ways. Firstly, by applying a wide array of RHS parameters for the political environment, it explicitly tests for the robustness of past findings. Secondly, it provides a comparative analysis of dichotomous and cardinal measures. Thirdly, by using panel data, the time element is incorporated and a criticism of past studies (e.g. point measurement) is overcome.[4] Appendix Table A2 presents the mnemonics of the variables used.

3.1.1 Political rights and civil liberty

4 As Sloan and Tedin (1987), we criticise the "point measurement" approach as 37 of the 82 economies in this study have changed political regime (as defined by Gastil, 1990) during the time-period. See Appendix 9.1 for a list of these regime changes.

Data for political rights and civil liberties are obtained from the Comparative Survey of Freedom project, which is an annual publication of countries' political rankings.[5] Political rights and civil liberties are ranked from 1 (the highest degree of liberty) to 7 (the lowest). These rankings are listed for each country in the main appendices to the thesis. As the data are available for a broad cross-section of countries and the rankings have been constructed annually since 1972, the data are suitable for both cross-section and panel data estimation.

Political rights measures the extent of political freedom that individual agents possess in their respective economies. A "checklist" of political rights (specific to Gastil, 1990) sets out the factors considered to represent comprehensive political rights within an economy. These are listed in Appendix A. Each ranking is defined in Table 2 (see, Gastil, 1981, p. 13-17).

[Insert Table 2 about here]

Civil liberty differs somewhat from political freedom in that it is not directly linked to the party system of government (Bilson, 1982). As with political rights, a checklist is provided as a measurement of civil liberties in economies (see, Gastil, 1990, p. 36). These are listed in Appendix B. Table 3 displays each of the civil liberty rankings and the corresponding description (see Gastil, 1981, pp. 17-23).

[Insert Table 3 about here]

There are some drawbacks of the rankings in the Comparative Survey of Freedom.[6] First, the indices are subjective and a *perceived* political regime may not necessarily behave in a manner

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5 These political rankings are often credited to Gastil. However, in recent years, the co-ordination of the survey has transferred to McColm (1991, 1992, 1993) and Karatnycky (1994).

6 Due to general dissatisfaction with conventional measures of political stability, Knack and Keefer (1995) have constructed political indices from information provided by private companies that specialise in studying risk for foreign investors. These indices rank countries on the risk that a government will expropriate private assets, repudiate contracts and fail to uphold the rule of law. A further index of "political credibility" has been constructed from a sample of entrepreneurial judgements in 28 developing countries (see Borner *et al*, 1995). This latter index proved to be highly correlated with economic growth and able to explain 50% of the variation in per capita growth in the countries sampled between 1981 and 1990. However, the small sample and the

consistent with its ranking. Second, it is unlikely that two economies with the same ranking are equally open or repressive. Third, Bilson (1982) argues that there is no presumption that the index is linear with respect to the hypothetical concepts of political rights and civil liberties. Hence, there is no presumption that a move from a ranking of 1 to 2 involves the same reduction in political rights or civil liberties as a move from 6 to 7.

3.1.2 Measures of conflict

Past empirical analyses have examined the stability of the political process vis-à-vis democracy, liberty, revolutions and assassination (see Barro, 1991), government changes (see Alesina *et al*., 1992) and income inequality. However, none of these variables are explicit tests of the factors of the productive process. An alternative to these measures is a parameter that directly reflects the relationship between political stability and, among other things, capital stock and labour force. One such measure is an assessment of conflict and war on national territory.[7] The logic behind applying this parameter is that home territory conflict destroys much of productive capital stock, particularly in urban areas, and reduces the labour force (through male fatalities), if conflict spills over to the civilian population.[8] Hence, conflict is considered particularly detrimental to the growth process.[9] Consider also that *national territory conflict* is an important feature, as conflict outside national boundaries has no direct effect on that economy's productive capacity, e.g. the productive

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subjectivity of the index may limit its academic use and the belief that political stability and economic growth always holds. Moreover, indices that have only recently been constructed are of little use in explaining historic differentials in growth and shed no light on such phenomenon as the "Asian growth miracle".

7 An alternative variable widely applied in empirical analysis is defence and military expenditure as a percentage of total GDP. A selection of the literature divides into three sections. Firstly, theoretical modelling (see Berthelemy *et al* (1995), secondly, cross-country empirical analysis (see Faini *et al*. (1984), Adams, Behrman and Boldin, 1992; Landau, 1994), and thirdly, country-specific studies. On this latter issue, see Adams, Mariano and Park (1992) and Chletsos and Kollias (1995).

8 Civilian unrest and conflict is a common feature of military conflict in LDE's.

9 There exists a "flip-side" to this argument. Economic historians would argue that the destruction of ageing capital stock and its immediate post-war replacement was a fundamental reason for the rapid development of the German economy after 1945. However, for various reasons, this is considered an exception to the rule.

capabilities of the UK remained untouched by the Falklands war. Furthermore, conflict requires increased military spending at the expense of growth-enhancing factors.[10]

Barro and Lee (1993, 1994) and Easterly and Rebelo (1993) constitute the only prominent empirical studies to have applied "war" as an explanatory variable. Barro and Lee (1993, 1994) apply two war parameters: a dummy variable for countries that participated in at least one external war over their estimated time period and a dummy variable for the fraction of time a country has been involved in military conflict. Easterly and Rebelo's (1993) dummy variable is specified as the number of war casualties per capita.

In this study, military data is applied from the Bruno and Easterly (1996) data set. This data is arranged as a dichotomous dummy variable for each year from 1960 to 1994, however excludes Australia, Ireland, New Zealand and Papua New Guinea. All other countries conform to the country-sample in this study. The applied "rule of thumb" is that a country is designated a dichotomous dummy variable of 1, if it has been involved in any domestic territory conflict. The excluded economies are all assumed to be 0 dummy variables. This "rule of thumb" is devised as there seems little to be gained from attempting to determine a relationship between length of conflict and economic growth. Central to this study is that conflict destroys a nation's productive resources. This could occur in either a 1-year or a 10-year conflict, is strongly country-specific and dependent on military spending and capabilities and is considered outside the scope of this study.[11] Furthermore, a second variable is constructed and uses the available data from the beginning of

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10 A counter argument states that military spending can promote economic growth by contributing to technological development, establishing specialised organisations that create new skills in short supply, fosters R&D, helps in the process of modernisation, and creates demand for industries which may suffer from underemployment of capital (Deger and Sen, 1983). Further benefits of military spending are proposed by Benoit (1973, 1978). Additionally on these issues, see Weede (1983b) and Marsh (1988). While these hypotheses may be empirically supported, the underlying argument in this study is that military conflict, which often imposes both unbudgeted and unaffordable expenditure to an economy, will, in the long-run, deny the private sector the necessary growth-enhancing investment.

Bruno and Easterly's (1996) data set, i.e. 1960, under the hypotheses that economic growth is negatively related to both preceding and "current" conflict.[12]

3.2 Measurement and variable construction

The political rights and civil liberties variables are applied as a test of Kormendi and Meguire (1985), Marsh (1988), Scully (1988) and Barro (1989).[13] These constitute prominent studies of the Comparative Survey of Freedom rankings. Controversy surrounds the "correct" specification for political parameters, i.e. as a dichotomous dummy variable as in Kormendi and Meguire (1985) and Scully (1988) or a cardinal variable (Marsh, 1988; Barro, 1989). This study provides a direct examination of this and other specification issues, e.g. small country sample (Kormendi and Meguire, 1985), lack of synchronisation of sample period and political measure (Kormendi and Meguire, 1985; Scully, 1988), and changing democratic character (Scully, 1988). Further dichotomous dummy variables are employed to test the influence of military conflict on growth. Eight variables proxy for the political climate. The applied parameters and underlying hypotheses are listed in Table 4.

[Insert Table 4 about here]

The advantages of panel data over a cross-section scarcely need emphasizing. A panel allows us to control properly for the heterogeneity of individual countries, both through the estimation procedure, and through the model specification. See Baltagi (1995) and Moulton (1986, 1987). It gives more informative data, more variability, less collinearity among the variables, more degrees of freedom and more efficiency, particularly in diagnostic testing. With specific reference to

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11 It is conceded that the military variable does not measure the seriousness of wars (reflected in expenditures, casualties, or the destruction of property) or the outcomes.

12 "Current" implies occurring within the sample period.

13 The variables employed in Scully (1988) differ somewhat from Kormendi and Meguire (1985) as the former take averages and derive dichotomous variables from these time-series averages.

this study, cross-section data neglect 95% of the total dataset. Moreover, virtually all empirical studies of money-in-the-production-function have been confined to individual country time-series data. See the seminal studies of Sinai and Stokes (1972, 1989) and the review in Evans (1997). The use of panel data to test political structure hypotheses constitutes a further contribution of this paper.

The panel consists of data from 82 countries (listed in Appendix Table A1) covering 21 years from 1972-1992; in terms of equation (1), this is a panel of N (=82) countries, and T (=21) years. There is a trade-off between availability of data in the time domain and that in the cross-section. For some countries, data are long-standing and up-to-date. For others, the data are of more recent origin or are severely unreliable. The time period was chosen to cover a sufficiently long period as to be able to examine the convergence issue in a way comparable to earlier studies. The cross-section was selected so as to include a comprehensive sample of income groups and geographical spread. The majority of the data derives from The World Bank tables (WBT); but additional data were extracted from the Barro-Lee database, International Financial Statistics, UNESCO, and the Summers-Heston Penn World tables (PWT). Various adjustments were made to the data to ensure compatibility among the different sources. In addition, local currency data were converted to US dollars using the real exchange rate (RER) calculated as:

$$RER = SP^{*} / P \tag{8}$$

where S is the spot exchange rate against dollars, P^{*} is the US price deflator, and P is the price deflator of the home country.

The traditional growth variables, output, capital and labour are relatively straightforward to measure. GDP and labour force are taken from the WBT, with initial GDP being that for 1972. Physical capital is estimated from gross investment (from the WBT) using the perpetual inventory

method with a depreciation rate of 5%, following, for example, King and Levine (1994) and Romer (1989). Several possible empirical counterparts of "money" and human capital have been suggested in the literature. Given this ambiguity, we employ 2 different definitions of money, and 3 of human capital. We then estimated models with all 6 permutations of these definitions, and compared the results from each set of estimates, both informally and with a non-nested specification test. For money, we employ a monetary measure and a credit measure. The former is defined as the ratio of M2 to GDP. The latter is defined as the ratio of domestic credit to GDP, following, for example, King and Levine (1993a). For human capital, it is generally agreed that rates of educational attainment provide a broad indicator of the skill-level of the workforce. Accordingly, our first two measures of human capital are primary and secondary school enrolment rates following numerous authors, for example: Barro (1991), and Roubini and Sala-i-Martin (1992). However, the enrolment rate has been subject to criticism in the literature, especially because it can be argued that it represents the flow of new capital rather than the stock of existing capital. See Psacharopoulos and Arriagada (1986). We therefore used as a third measure real public expenditure on education, following Landau (1986).

3.3 Estimation and testing procedures

Following Barro (1991, 1992) and Barro and Lee (1993, 1994), regional dummy variables for Latin America, Sub-Saharan Africa and south-east Asia are also included in the unrestricted equation. Regional dummy variables are included on the basis that growth rates in these regions are either far lower or higher than the total sample mean growth rate of 0.85% (see Evans, 1998, Table 5.3). The mean average growth rate in Latin America is -0.26%, 1.11% below the mean level. In Sub-Saharan Africa, the average real growth rate is -0.77%. This is 1.62% lower than the total mean growth rate. In contrast, south-east Asia reports an average real growth rate of 4.69%,

3.84% above the mean. The inclusion of these regional dummies may capture social and cultural factors that may not necessarily be explicated in the underlying model.[14] The hypothesis is that if enough explanatory variables have been included to explain why growth is below or above average in these regions, then the estimated coefficients of the dummy variables should not differ significantly from zero (see Barro and Sala-i-Martin, 1995).

The unrestricted estimations of Equation (7) are non-nested since the political variable in one model is not included as an explanatory variable in another. We therefore apply a procedure for encompassing based on the Davidson and MacKinnon (1981) J-test. Specifically, a pairwise estimation procedure is applied and the predicted value of each equation is added as an explanatory variable to the competing model. The J-test is performed for each political parameter in the translog functional form with panel data. Only models that reject $?_0$ are estimated and the estimation technique is OLS. Test restrictions are determined by parameter significance and insignificant variables are omitted to form a more specific model as proposed by Hendry (1995).

4. Empirical results

The regression results for cross-section data analysis are presented in Tables 5-8. The dependent variable is the growth rate of real per worker GDP. The standard errors of the coefficients are corrected for heteroskedasticity using White's (1980) procedure. Approximately two-thirds of the variation in output is explained, and the results suggest a link between political structure and economic performance.

Prior to political analysis, initial findings suggest a concurrence with the RHS parameters. The convergence effect is supported with *Y72* significantly negative at the 1% level. The growth of

[14] Distinct from regional analysis, Milner and Westaway (1993) present empirical evidence of economic growth and country geographic characteristics, e.g. size, population, area, etc.

the capital stock is significantly positive at the 1% level and its coefficient ranges from 0.39 to 0.43. The "money in the production function" hypothesis is supported as domestic credit enters significantly positive at the 1% confidence level. Human capital, as proxied by the growth of secondary school enrolment ratio reports positive coefficients (bar Equation 2), however these do not differ significantly from zero.

Holding other factors constant, the results of the political hypotheses suggest that economies with relatively free political and civil regimes fare better in the growth process than those which repress these freedoms. Support is therefore given to the "compatibility" perspective, which advocates that full political rights and civil liberties generate the conditions most conducive to economic development. The results suggest that open political systems present citizens with fundamental safeguards against governmental intrusion and introduce conditions that encourage competition and predictability. This, it is argued, generates the necessary motivation to work, save and invest (see Claude, 1968; Goodell and Powelson, 1982). The results support the classical school which argues that political rights and liberty are vital preconditions for economic progress. The results refute the neo-classical theory of development which argues that the state's primary role in economic growth is to develop policies designed to substitute public for private resources whenever the latter are insufficient or not forthcoming.[15] The results are reported in Table 5 and summarised in Table 6.

[Insert Tables 5 and 6 about here]

All variables (bar *CL2*) are of the expected sign and the majority are significant at conventional confidence levels. An initial observation from Table 6 is that, whereas open

[15] Care is required in defining government policy and resources. As Grier and Tullock (1989) note, the central problem in assessing political factors on growth is defining the relevant types of government activity that are proxied. Government production of basic valuable public goods (e.g. roads, property rights) will clearly be

governmental and civil regimes are good for growth, there is no strict evidence (at least with the dichotomous parameters) that "closed" regimes are bad for growth. In contrast, this is not found with the cardinal parameters, which assign a significantly negative role to higher average classifications of political rights and civil liberties. This finding supports studies which argue that dichotomous dummy variables may be guilty of "loss of information".

The results are consistent with the findings by Scholing and Timmermann (1988), Scully (1988), Sirowy and Inkeles (1990), Alesina *et al*. (1992) and Sachs and Warner (1995). In the former study, it is argued that the security of property and certainty about the "legal claims of income" leads to higher rates of capital accumulation, defined as the ".... *sine qua non* of economic development". In contrast, a much earlier study by Huntington (1968) argues that only an authoritarian government is able to implement the policies required for the accumulation of capital. Sachs and Warner's (1995) division of 111 economies into politically "open" and "closed" (admittedly crude classifications) resulted in "open" economies growing at a "strikingly faster rate" than "closed" nations.[16] The results further reject the theory of "political authoritarianism" as espoused by Marsh (1988) and suggest that a pertinent policy issue for international agencies is to attempt to transform authoritarian states into democracies that allow for free elections, multiple political parties, and adherence to a meaningful legislative framework. Note an admission: these are not innovative findings or policy proposals, but add further weight to a growing band of literature that finds politically open economies most conducive to growth.

Both "war" variables advance negative and significant coefficients, implying that conflict has a destructive effect on productive resources. The results suggest that military conflict places a strain

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growth-enhancing. Government regulation of economic activity (e.g. excessive regulation and bureaucracy) will probably slowdown economic growth.

on an economy's absorptive capacity and puts pressure on the available supplies of capital, skilled capital and foreign exchange. This is explained by Chletsos and Kollias (1995). Internal borrowing financed military spending competes with investment for funds. Such borrowing puts pressure on interest rates and reduces private investment. A similar argument is proposed by Deger (1985, 1986), who suggests that military conflict is financed by three forms of savings: that emanating from the foreign sector, government fiscal surplus and private or non-governmental surplus of income over expenditure. It follows that any increase in military expenditure, *ceteris paribus*, must be at the expense of investment. These findings concur with Easterly and Rebelo (1993), however are at odds with Barro and Lee (1993, 1994). As disparate proxies for *war* are employed in these analyses, a direct comparison may prove somewhat misleading.

Significant coefficients on the regional dummy variables indicate that the underlying model does not explain the systematic variation in growth rates across these regions. Negative coefficients for Latin America and sub-Saharan Africa indicates that the model still does not fully explain why the countries in these regions experience below-average growth. An explanation proposed by Barro and Sala-i-Martin (1995) is that part of the slow growth in Latin America reflects adverse effects of government policies, such as corruption and market distortions. This could also be relevant to the sub-Saharan African experience. A positive coefficient for south-east Asia implies that its higher than average growth rates are not adequately captured by the applied variables.

We have also tested the functional form test to ascertain whether the translog "collapses" to a Cobb-Douglas. Evidence is mixed but a host of estimations reject the hypothesis that the squares and cross-products equate to zero. The translog regressions are "better-fitting" than the Cobb-Douglas models, particularly when the insignificant parameters are omitted. *K* is significantly positive

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16 Aside from the openness of government, many studies argue that smaller government, measured by

at the 1% level; *CR* is positive but insignificant (except where *PE* is included) denoting that its explanatory power is restricted to the square and cross-product parameters; human capital, however defined, is negative but insignificant; *M2* is positive but generally insignificant; all squared parameters exhibit diminishing returns (hence reject endogenous growth); *KY72* is significantly positive and possibly proxies for learning-by-doing; while the cross-product of capital and real balances is positive but only significant when *CR* proxies for the financial system.

[Insert Table 7 about here]

Of particular interest in this study is the behaviour of the political variables when they interact with other parameters. Prior to assessing the interactive terms, individual parameters *PRA* and *PR1* both report different signs to the theoretical estimations and both are significant. A possible explanation is in their relationship with capital. The quadratic terms *KPRA* and *KPR1* report signs at odds with the individual political parameter. This suggests that a repressive political regime may be growth enhancing once account is made of its effect on capital. The opposite may be true of an "open" political regime. This suggests that policies geared towards capital accumulation is the most significant distinction between democratic and non-democratic political systems. The evidence is in contrast to the theories (not extended to empirical analysis) proposed by Huntington (1968), Chirot (1977), Marsh (1979), and Sorenson (1993).

The interaction terms inclusive of political parameters are generally uniform. Based on Table 6, the main findings can be stated as follows:

? Capital is positively related to open political regimes (*KPR1*); negatively related to closed political systems (*KPR2*, *KCL2*) and countries involved in military conflict (*KW1*).

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government expenditure as a proportion of GDP, is beneficial to the growth process. On this issue, see Landau (1983, 1986) and Ram (1986).

? Both domestic credit and *M2* growth are positively related to open regimes (*CRPR1*, *M2PRI*) and negatively related to repressive political and civil governments (*M2CL2*).

? School enrolment rate growth is lower in non-democratic countries (*SSPRA*, *SSCLA*).

? Public expenditure on education growth is higher in open political systems (*PEPR1*); lower where political and civil liberties are reduced (*PEPR2*, *PECL2*).

The findings suggest that political freedom facilitates economic performance via capital accumulation. The alternative hypothesis that rapid growth requires autocratic control and reduced freedom receives no support. This concurs with Kormendi and Meguire (1985), who find that the effect of civil liberty on growth operates mainly through the investment channel.[17] In addition, the inclusion of the "freedom" variable in Kormendi and Meguire (1985) virtually eliminates the effects of all other variables in explaining investment. If a similar mechanism is at work here, this may explain why *CR* and *M2* become insignificant in the presence of political variables. As Kormendi and Meguire (1985), Barro (1989) finds that fewer political rights are associated with lower investment in physical capital. For a similar finding, see Pourgerami (1988), Edwards (1992, 1993) and Helliwell (1992).

The mechanism through which political and civil repression adversely affects capital accumulation may be explicated by standard corporate finance theory on investment. Greater uncertainty about future net returns (caused by political and/or social unrest) makes investors demand higher yields on their investment. Assuming that investment opportunities are constant over time, a demand for higher returns implies fewer economically viable investment projects. Schneider

[17] In Kormendi and Meguire (1985), the inclusion of a "freedom" parameter substantially reduces the importance of the mean growth in the rate of inflation, which according to the Tobin-Mundell hypothesis has a positive effect on growth. No evidence was found of this in Gupta (1988). The Tobin-Mundell effect involves a shift away from real money balances toward real capital as a consequence of higher anticipated inflation. Under more rapid growth of inflation, the Tobin-Mundell effect would imply a shift toward real capital and hence greater economic growth. Consider however, the counter-arguments to this theory as proposed by Stockman (1981), and

and Frey (1985) report that political unrest significantly reduces the inflow of FDI. Furthermore, Pindyck and Solimano (1993) argue that aggregate investment is very sensitive to uncertainty, because of asymmetry in the reaction of investment to shocks.

The results suggest that military conflict reduces the level of capital investment. This may be explained by the fact that military conflict requires commitment to increase defence expenditure, which consumes scarce resources and re-allocates valuable inputs into armaments production (Deger, 1985).[18] This finding is in contrast to Weede (1983a) and Marsh (1988). Deger (1985) further argues that autonomous defence expenditure reduces growth rates in LDE's. If LDE's spend less on the military, resources could be allocated to more highly productive investments, which would increase economic growth rates. In contrast, note that Benoit (1973) asserts that defence burdens and growth are positively related in LDE's.

Real money growth is higher in politically open systems. Democratic regimes are usually capitalist/social democratic economies with well-developed financial systems. In contrast, repressive regimes have limited market-oriented policies for real balances accumulation. The results for interaction terms inclusive of schooling statistics concur with Helliwell (1992): democracy has a positive effect on subsequent schooling. Findings for variables including *PE* are unsurprising given the low regard to education in many dictatorial regimes. Deger (1985) argues that given an upper limit to national budgets, an increase in military expenditure could be at the expense of education spending.[19] Furthermore, it may be easier in less democratic countries to reduce education expenditure as there are less obstacles (lobby groups, political opposition) to decreasing educational provision.

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conventional wisdom for LDE's which suggest that inflation is often caused by political crises that depress the rate of economic growth.

[18] This analysis assumes a positive relationship between military conflict and defence expenditure.

[Table 8 about here]

The J-test encompassing approach is estimated for a translog specification in a pairwise format and the results are presented in Table 8. The results generally support the Cobb-Douglas findings, that is, *PRA* and *PR1* encompass most other parameters (exceptions to *PRA* are *PR1* and *CL1*, while the exceptions to *PR1* are *PR2*, *CL1* and *W1*). The results on *PR2* and *CL1* are mixed, and *CLA* is found to encompass all however, is itself encompassed by *CL1*. Parameter *CL2* is encompassed by *W1* and *W2*, while *W1* encompasses *W2*. The results suggest that *PRA*, *PR1* and *W1* are the most "informative" political parameters in the translog format.

In general, all political parameters bar *CL2* are correctly signed, however only *PR* reports a significant coefficient (negative at the 1% level). This suggests that economic growth is negatively related to closed political systems. The mechanism outlining this affect on growth is documented above. The findings support the studies of Kormendi and Meguire (1985), Pourgerami (1988), Scully (1988), Barro (1989), Helliwell (1992) *et al*. (see de Haan and Siermann, 1994). From the aspect of pooled studies, the findings support Grier and Tullock (1989) but are at odds with Landau (1986). However, a direct comparison with Landau (1986) may be somewhat erroneous as he regresses a democracy variable on growth rather than a parameter that captures political rights. An interesting finding is that political rights have a more significant influence on growth than civil liberties. This suggests that the functions of government *per se*, e.g. legislation and public expenditure may, at the micro-level, be more influential for growth than various facets of civil liberty, e.g. media ownership, religious tolerance, freedom of demonstration, etc. Military conflict is found to have an adverse influence on an economy's productive capabilities. This finding remains valid in Cobb-

[19] Sivard (1977) and Jolly (1978) estimate that a 15% reduction in military expenditure in certain LDE's is sufficient to support programmes of increasing primary school provision and extending literacy to all adults.

Douglas and translog forms of the production form, and whether we pply cross-section or panel data.

5. Conclusion

This paper presents an empirical investigation into the relationship between economic growth and political structure using cross-section as well as panel data. The broad findings that emerge can be summarised as follows. Holding other factors constant, politically open economies experience faster rates of per capita growth than authoritarian regimes. A similar result is found in the case of civil liberties. Military conflict has a deleterious influence on economic growth. Furthermore, cross-section analysis is unable to fully explain variations in the recent growth experience of sub-Saharan Africa, Latin America and south-east Asia. In contrast, panel data is able to explain their respective growth performances.

The results follow much of previous empirical literature and support the "compatibility theory" on economic growth and political structure. Politically open societies, which bind themselves to the rule of law, to private property, and to the market allocation of resources engender economic conditions that are conducive to higher investment, production and competition, without undue hindrance from bureaucracy and legislation. The full provision of social capabilities enables individuals to create and exploit more effectively economic opportunities and contributes to improving prosperity. This study thereby endorses much of the liberal theories of the old classical school of economics. The results of this study imply that authoritarian regimes limit the incentive of economic agents to private and social reward and profit by placing unnecessary distortions on free enterprise and by a general waste of productive resources. Furthermore, military conflict has a

destructive effect on productive resources and seriously disrupts the saving and investment process considered crucial for economic development.

The paper also addresses the issue of data description and its use with different functional specifications. Two arguments stand out. First, the "point" versus "period" measurement issue. Results show that "period" measurement is able to incorporate changes in political regimes (nearly half the economies in this study are found to have altered their system of government). Hence, this is a preferred empirical method to "point" measurement. Future research, however, needs to develop more comprehensive measures of the political system, particularly on the political factors that specifically relate to economics.

The reported results allow for the determination of specific policy; however, notable exceptions exist that do not concur with the findings. Certain Asian economies, particularly South Korea and Malaysia, have succeeded in fostering remarkable rates of economic growth despite the largely authoritarian nature of their political systems. While the "Asian economic miracle" is a source of exhaustive study among economists, prominent among this research should be an attempt to derive how Asian authoritarian states differ from their African and Latin American counterparts. As a conjecture, it is likely that a tradition of relatively free movement of capital, trade and human resources and a superior "entrepreneurial-ethic" holds the key to development in these economies, which remain the exception rather than the rule in the relationship between political structure and economic growth.

Despite the results, more research is required on this issue, particularly on the methods of analysis, model specification and causality. Also, research is necessary on the channels through which the political regime affects the growth process. Furthermore, richer measures of the institutional framework need to be developed. However, as these results conform to many

preceding studies, the configuration of the appropriate structure of property rights and free trade and enterprise for economic development needs to be brought to the forefront of development economics.

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Table 1 Measures of political structure

Author	Measure	Construction	Source
Kormendi and Meguire (1985)	Civil Liberties	=1 if civil rights ranking is 1 or 2 in 1979; 0 otherwise	Gastil
Landau (1986)	Democracy	=1 if country has been democracy since 1950's or since independence and zero otherwise	Landau (1986)
Sloan and Tedin (1987)	5 categories, including traditional authoritarian (TA) and bureaucratic-authoritarian (BA)	TA, BA, democracies, communist regimes, and transitional regimes	Sloan and Tedin (1987)
Pourgerami (1988)	Democracy	varies from 5 to 1 depending on frequency of violations of human rights (5 if no violations)	Pourgerami (1988)
Scully (1988)	Pol open; Pol closed; Indiv. rights; State rights	=1 if pol. Rights <2 and 0 otherwise =1 if pol. rights >5 and 0 otherwise =1 if civ. Rights <2 and 0 otherwise =1 if civ. Rights >5 and 0 otherwise	Gastil
Marsh (1988)	Political and civil rights	sum of Gastil's rankings over the period 1973-79	Gastil
Grier and Tullock (1989)	Dummy for lack of civil liberties	=1 if civ. Rights is 6 or 7	Gastil
Barro (1989)	Political rights	average of pol. rights ranking for 1973-85	Gastil
Persson and Tabellini (1991)	Democracy	=1 if country has been democracy for more than 75% of sample period and is zero otherwise	Bank's Political Handbook of the World and Taylor and Jodice (1983)
Helliwell (1992)	Gastil, Bollen and Pourgerami	linear transformation of Gastil's civil and political rights indices, from 0 to 1 (free); the Bollen-index and the Pourgerami index	Gastil, Bollen (1990) and Pourgerami (1988)
Alesina et al. (1992)	Democracy	=1 for countries with free elections =2 for countries with some form of elections but with limits =3 for countries in which leaders are not elected	Bank's Political Handbook of the World

Table 2 Ranking of political rights

Ranking	Description
1	Economy has a fully competitive electoral process
2	As ranking 1, however factors may exist to doubt the absolute equality of the electoral process
3	Less effective implementation of democratic process than 1 and 2
4	Ditto 3, but government may have been selected outside the public view by various faction leaders
5	No effective voting processes in place, however strive for consensus among a variety of groups in society
6	No competitive electoral processes are permitted, however ruler(s) may Respond to certain popular desire (e.g. Islamic beliefs)
7	Power is controlled by political despots only

Table 3 Ranking of civil liberties

Ranking	Description
1	Government has no influence on press output; the courts protect the individual; private rights are respected and persons are not imprisoned for their opinions
2	As 1, however the police and courts have a more authoritarian tradition
3	Political prisoners *may* exist and there will be an element of censorship in the media; the police have a wide range of powers
4	The media is heavily censored, free speech is limited and torture may be Prevalent
5	Little or no free press; police and the courts have seemingly total control on social order; political prisoners and torture is commonplace
6	Political prisoners exist; the media is under government supervision; there is no right of assembly; travel is likely to be restricted. Private conversation may be relatively free; underground literature is published and illegal demonstrations take place; torture may be commonplace
7	There exists pervading fear, little (if any) independent expression is permitted, no public expressions of opposition emerge, and imprisonment and/or execution for political beliefs is common

Table 4 Hypotheses for panel data political analysis

Hyp.	Description	Variable Specification
1	Higher classification of political rights is negatively related to growth (*PR*)	Political rights time-series
2	Higher classification of civil liberties equates to lower growth (*CL*)	Civil liberties time-series
3	Full political rights has a positive impact on growth (*PR1*)	Dummy variable =1 if political rights <2; otherwise 0
4	An absence of political rights has a negative impact on growth (*PR2*)	Dummy variable =1 if political rights >5; otherwise 0
5	Full civil liberties has a positive impact on growth (*CL1*)	Dummy variable =1 if civil liberties <2; otherwise 0
6	An absence of civil liberties has a negative impact on growth (*CL2*)	Dummy variable =1 if civil liberties >5; otherwise 0
7	Conflict (current) on national territory has a negative effect on growth (*W1*)	Dummy variable =1 if country engaged in conflict (1972 to 1992); otherwise 0
8	Conflict (preceding and current) on national territory negatively effects growth (*W2*)	Dummy variable =1 if country engaged in conflict (1960 to 1992); otherwise 0

Table 6 Summary of translog panel regression results

Variable	Sig. Level	Equation no.	Variable	Sig. level	Equation no.
PR	(-) 1%	1,2	*CRPR1*	(+) 1%	5,6
CL	(-) 5%	3,4	*KPR2*	(-) 1%	7,8
PR1	(+) 1%	5,6	*CRPR2*	(-) 1%	7,8
CL1	(+) 10%	9,10	*KCL1*	(+) 1%	9,10
W1	(-) 1%	13,14	*CRCL1*	(+) 1%	9,10
W2	(-) 1%	15,16	*KCL2*	(-) 10%	12
KPR	(-) 1%	1,2	*CRCL2*	(-) 1%	11,12
CRPR	(-) 1%	1,2	*KW1*	(-) 1%	13,14
SSPR	(-) 5%	1,2	*CRW1*	(-) 1%	13,14
KCL	(-) 5%	3,4	*SSW1*	(+) 1%	13,14
CRCL	(-) 1%	3,4	*KW2*	(-) 1%	15,16
SSCL	(-) 10%	3	*CRW2*	(-) 1%	15,16
	(-)1%	4	*SSW2*	(+) 10%	15
KPR1	(+) 1%	5,6		(+) 5%	16

Table 7 Panel Data Functional Form Test for Political Parameters (Cobb-Douglas vs. Translog)

	F-test (at the 5% level)		
Explanatory Variables	**Calculated Value**	**Critical Value**	**Result**
CR, SS and PR (12,1623)	21.662	1.758	REJECT NULL
CR, SS and CL (12,1623)	21.231	1.758	REJECT NULL
CR, SS and PR1 (12,1623)	18.480	1.758	REJECT NULL
CR, SS and PR2 (12,1623)	21.423	1.758	REJECT NULL
CR, SS and CL1 (12,1623)	21.274	1.758	REJECT NULL
CR, SS and CL2 (12,1623)	21.421	1.758	REJECT NULL
CR, SS and W1 (12,1623)	25.396	1.758	REJECT NULL
CR, SS and W2 (12,1623)	21.951	1.758	REJECT NULL

Table 5a Panel Data Estimation of Political Parameters (Translog)

Dependent variable: GDP per worker, 1972-1992 (82 economies)

	EQUATION									
Var.	**(1)**	**(2)**	**Var.**	**(3)**	**(4)**	**Var.**	**(5)**	**(6)**	**Var.**	**(7)**	**(8)**
C	0.001 (0.10)	0.001 (0.14)	c	-0.034 (-2.83)5	-0.032 (-2.75)5	c	-0.057 (-3.38)5	-0.056 (-3.35)5	c	-0.054 (-3.22)5	-0.058 (-3.42)5
Y72	-.6E-06 (-1.30)	-.7E-06 (-1.32)	Y72	.5E-06 (1.04)	.5E-06 (1.01)	Y72	-.3E-07 (-0.05)	-.6E-07 (-0.11)	Y72	.1E-05 (2.72)5	.1E-05 (3.61)5
K	0.076 (0.59)	0.022 (0.32)	K	0.079 (0.61)	0.005 (0.08)	K	0.134 (1.06)	0.145 (1.74)*	K	0.049 (0.37)	0.018 (0.22)
CR	0.528 (7.46)5	0.533 (7.85)5	CR	0.612 (8.12)5	0.617 (8.44)5	CR	0.418 (5.89)5	0.404 (6.08)5	CR	0.562 (7.69)5	0.541 (8.04)5
SS	-0.152 (-1.07)	- -	SS	-0.176 (-1.22)	- -	SS	-0.261 (-1.90)*	-0.107 (-2.33)Ù	SS	-0.225 (-1.64)*	-0.104 (-2.27)Ù
PR	-0.012 (-6.50)5	-0.012 (-6.54)5	CL	-0.005 (-2.17)Ù	-0.005 (-2.23)Ù	PR1	0.031 (2.88)5	0.032 (2.93)5	PR2	-0.006 (-0.84)	- -
K^2	-0.007 (-0.67)	- -	K^2	-0.005 (-0.51)	- -	K^2	.6E-03 (0.06)	- -	K^2	-0.002 (-0.13)	- -
CR^2	-0.012 (-5.49)5	-0.012 (-5.45)5	CR^2	-0.013 (-5.51)5	-0.012 (-5.48)5	CR^2	-0.006 (-2.63)5	-0.006 (-2.79)5	CR^2	-0.020 (-7.28)5	-0.020 (-7.35)5
SS^2	-0.008 (-0.87)	- -	SS^2	-0.010 (-1.11)	- -	SS^2	-0.011 (-1.19)	- -	SS^2	-0.009 (-1.00)	- -
KY72	-.4E-04 (-4.67)5	-.1E-04 (-6.21)5	KY72	-.1E-04 (-4.82)5	-.1E-04 (-6.33)5	KY72	-.7E-05 (2.74)5	-.6E-05 (-2.97)5	KY72	-.E-04 (-5.85)5	-.1E-04 (-7.87)5
KCR	0.028 (9.29)5	0.027 (9.48)5	KCR	0.027 (9.15)5	0.027 (9.32)5	KCR	0.023 (7.40)5	0.023 (8.65)5	KCR	0.029 (9.37)5	0.030 (9.67)5
KSS	-0.010 (-1.87)*	-0.014 (-3.35)5	KSS	-0.010 (-1.85)*	-0.013 (-2.90)5	KSS	-0.011 (-2.01)Ù	-0.011 (-2.03)Ù	KSS	-0.012 (-2.24)Ù	-0.014 (-2.60)5
KPR	-0.022 (-3.58)5	-0.022 (-3.63)5	KCL	-0.019 (-2.40)Ù	-0.019 (-2.42)Ù	KPR1	0.171 (4.23)5	0.185 (4.73)5	KPR2	-0.092 (-3.44)5	-0.089 (-3.62)5
CRY72	.5E-06 (3.08)5	.6E-05 (3.10)5	CRY72	.4E-05 (1.97)Ù	.4E-05 (2.01)Ù	CRY72	.1E-05 (0.59)	- -	CRY72	.4E-05 (2.26)Ù	.4E-05 (2.16)Ù
CRSS	0.027 (6.52)5	0.027 (6.62)5	CRSS	0.027 (6.44)5	0.028 (6.52)5	CRSS	0.028 (6.35)5	0.027 (6.46)5	CRSS	0.029 (6.78)5	0.027 (6.97)5
CRPR	-0.024 (-4.34)5	-0.023 (-4.30)5	CECL	-0.041 (-5.12)5	-0.041 (-5.08)5	CRPR1	0.198 (4.62)5	0.214 (6.65)5	CRPR2	-0.167 (-5.51)5	-0.167 (-5.57)5
SSY72	-.6E-05 (-2.22)Ù	-.6E-05 (-2.25)Ù	SSY72	-.6E-05 (-1.65)*	-.6E-05 (-2.08)Ù	SSY72	.5E-05 (-1.47)	-.3E-05 (-1.23)	SSY72	-.4E-05 (-1.58)	- -
SSPR	-0.015 (-2.03)Ù	-0.018 (-3.08)Ù	SSCL	-0.018 (-1.65)*	-0.021 (-2.87)5	SSPR1	0.033 (0.63)	- -	SSPR2	-0.023 (-0.73)	- -
R2	.70	.70	R2	.69	.69	R2	.69	.69	R2	.69	.69
SE	0.097	0.097	SE	0.099	0.098	SE	0.098	0.099	SE	0.098	0.099
Haus[a]	25.34	23.75	Haus	8.56	4.89	Haus	6.06	1.88	Haus	8.106	3.903
RS2[b]	1.16	2.97	RS2	1.19	1.99	RS2	0.27	0.04	RS2	3.39	3.06
RS3	1.54	2.63	RS3	1.36	2.39	RS3	0.33	0.42	RS3	3.16*	2.48
LM[c]	4.20	4.21	LM	4.00	4.00	LM	1.58	1.59	LM	1.57	1.58
AU1[d]	3.76	3.09	AU1	3.31	3.65	AU1	2.91	2.16	AU1	2.65	2.12
AU2	4.45	4.14	AU2	4.23	3.92	AU2	3.94	2.09	AU2	3.87	3.82
F[e]	-	0.49	*F*[e]	-	0.64	*F*[e]	-	0.52	*F*[e]	-	0.75

Notes: Figures in parentheses are *t*-statistics.

5 significant at the 1% level; Ù significant at the 5% level; * significant at the 10% level.

[a] The Hausman test is distributed as a $?^2$ statistic. The critical value at the 5% level at 12 df. = 21.0; at 13 df. = 22.4; at 14 df. = 23.7; at 17 df. = 27.6.

[b] *Test of functional form*: RESET tests were carried out by including the square (2) and the cube (3) of the predicted values of each regression as additional explanatory variables. *F* values are reported above for the tests of the (joint) significance of the additional regressor(s). * indicates significance at the 5% level where the critical value of the squared parameter (2) = 3.75; critical value of cubed parameter (3) = 3.00.

[c] *Test for Heteroskedasticity*: The LM test is distributed as a $?^2$ statistic. The critical value at 82 df. = 104.14.

[d] *Test for Serial Correlation*: The Breusch-Godfrey LM test is distributed as a $?^2$ statistic. At the 5% level, the critical value at 1 df. = 3.84; at the 5% level, the critical value at 2 df. = 5.99.

[e] *F-Test*: The critical value at (3,1623) = 2.60; at (4,1623), the critical value = 2.37; at (5,1623), the critical value = 2.21.

Table 5b Panel Data Estimation of Political Parameters (Translog)

Dependent variable: GDP per worker, 1972-1992 (82 economies)

	EQUATION									
Var.	**(9)**	**(10)**	**Var.**	**(11)**	**(12)**	**Var.**	**(13)**	**(14)**	**Var.**	**(15)**	**(16)**
c	-0.056 (-3.74)5	-0.056 (-3.87)5	c	-0.060 (-3.82)5	-0.057 (-3.21)	c	-0.043 (-3.33)5	-0.043 (-3.41)5	c	-0.043 (-3.45)5	-0.043 (-3.51)5
Y72	.3E-06 (0.51)	.3E-06 (0.56)	Y72	.1E-05 (3.41)5	.1E-05 (3.36)5	Y72	.7E-06 (1.93)*	.8E-06 (2.07)Ù	Y72	.7E-06 (1.90)*	.8E-06 (2.04)Ù
K	0.145 (1.14)	0.112 (1.40)	K	0.106 (0.84)	0.091 (1.13)	K	0.046 (0.38)	0.084 (1.04)	K	0.081 (0.64)	0.114 (0.85)
CR	0.406 (5.89)5	0.389 (6.24)5	CR	0.576 (7.93)5	0.583 (8.30)5	CR	0.435 (6.43)5	0.396 (6.75)5	CR	0.440 (6.41)5	0.376 (6.45)5
SS	-0.255 (-1.85)*	-0.099 (-2.16)Ù	SS	-0.239 (-1.73)*	-0.127 (-2.77)5	SS	-0.132 (-0.89)	-0.204 (-7.00)5	SS	-0.204 (-1.35)	-0.204 (-6.77)5
CL1	0.024 (1.85)*	0.024 (1.89)*	CL2	0.006 (0.77)	- -	W1	-0.030 (-4.15)5	-0.030 (-4.16)5	W2	-0.024 (-3.53)5	-0.024 (-3.46)5
K^2	-0.191 (-0.17)	- -	K^2	-.6E-03 (-0.05)	- -	K^2	-0.012 (-0.24)	- -	K^2	-0.009 (-0.26)	- -
CR^2	-0.007 (-2.88)5	-0.007 (-3.26)5	CR^2	-0.018 (-7.00)5	-0.018 (-7.09)5	CR^2	-0.008 (-3.23)5	-0.030 (-4.16)5	CR^2	-0.008 (-3.30)5	-0.008 (-3.37)5
SS^2	-0.010 (-1.16)	- -	SS^2	-0.008 (-0.93)	- -	SS^2	0.004 (0.38)	- -	SS^2	-0.271 (-0.25)	- -
KY72	-.8E-05 (-2.98)5	-.8E-05 (-3.90)5	KY72	-.1E-04 (-6.29)5	-.1E-04 (-8.13)5	KY72	-.1E-04 (-5.57)5	-.1E-04 (-5.87)5	KY72	-.1E-04 (-5.61)5	-.1E-04 (-6.34)5
KCR	0.024 (7.94)5	0.024 (9.22)5	KCR	0.027 (8.79)5	0.027 (9.15)5	KCR	0.018 (5.76)5	0.018 (5.86)5	KCR	0.021 (6.88)5	0.023 (8.80)5
KSS	-0.011 (-1.98)Ù	-0.012 (-2.30)Ù	KSS	-0.011 (-2.02)Ù	-0.012 (-2.15)Ù	KSS	-0.002 (-0.40)	- -	KSS	-0.004 (-0.81)	- -
KCL1	0.167 (3.68)5	0.169 (3.93)5	KCL2	-0.035 (-1.34)	-0.047 (-1.96)Ù	KW1	-0.206 (-8.40)5	-0.210 (-8.75)5	KW2	-0.146 (-5.89)5	-0.147 (-6.44)5
CRY72	.3E-06 (0.13)	- -	CRY72	.5E-05 (2.51)Ù	.4E-05 (2.44)Ù	CRY72	.7E-05 (3.94)5	.7E-05 (3.85)5	CRY72	.7E-05 (3.58)5	.6E-05 (3.42)5
CRSS	0.027 (6.28)5	0.026 (6.57)5	CRSS	0.030 (7.21)5	0.031 (7.33)5	CRSS	0.022 (5.15)5	0.019 (5.47)5	CRSS	0.024 (5.41)5	0.020 (5.46)5
CRCL1	0.275 (5.34)5	0.278 (7.01)5	CRCL2	-0.156 (-5.27)5	-0.161 (-5.53)5	CRW1	-0.098 (-4.06)5	-0.102 (-4.27)5	CRW2	-0.097 (-3.91)5	-0.102 (-4.17)5
SSY72	-.2E-05 (-0.72)	- -	SSY72	-.5E-05 (-1.76)*	-.4E-05 (-1.60)	SSY72	-.3E-05 (-1.07)	- -	SSY72	-.3E-05 (-1.26)	- -
SSCL1	-0.019 (-0.26)	- -	SSCL2	-0.020 (-0.60)	- -	SSW1	0.098 (2.76)5	0.097 (3.20)5	SSW2	0.057 (1.67)*	0.069 (2.38)Ù
R2	.69	.69	R2	.69	.69	R2	.69	.70	R2	.69	.69
SE	0.098	0.099	SE	0.099	0.098	SE	0.098	0.097	SE	0.098	0.098
Haus[a]	7.35	3.08	Haus	8.41	4.18	Haus	5.53	4.95	Haus	6.24	5.89
RS2[b]	0.62	0.01	RES2	1.11	0.51	RES2	0.09	0.42	RES2	0.20	0.01
RS3	0.84	0.70	RES3	1.21	0.52	RES3	0.79	0.70	RES3	0.27	0.06
LM[c]	1.58	1.58	LM	1.57	1.57	LM	1.45	1.45	LM	1.55	1.56
AU1[d]	3.10	2.19	AUT1	2.43	2.42	AUT1	1.65	2.33	AUT1	2.58	3.65
AU2	3.25	2.44	AUT2	2.92	2.51	AUT2	2.38	2.58	AUT2	2.63	2.49
F^e	-	0.55	F^e	-	0.27	F^e	-	0.59	F^e	-	0.65

Notes: Figures in parentheses are *t*-statistics.

5 significant at the 1% level; Ù significant at the 5% level; * significant at the 10% level.

[a] The *Hausman test* is distributed as a $?^2$ statistic. The critical value at the 5% level and at 13 df. = 22.4; at 14 df. = 23.7; and at 17 df. = 27.6.

[b] *Test of functional form*: RESET tests were carried out by including the square (2) and the cube (3) of the predicted values of each regression as additional explanatory variables. *F* values are reported above for the tests of the (joint) significance of the additional regressor(s). The critical value of the squared parameter (2) at the 5% level = 3.75; and the cubed parameter (3) = 3.00.

[c] *Test for Heteroskedasticity*: The LM test is distributed as a $?^2$ statistic. The critical value at 82 df. = 104.14.

[d] *Test for Serial Correlation*: The Breusch-Godfrey LM test is distributed as a $?^2$ statistic. At the 5% level, the critical value at 1 df. = 3.84; at the 5% level, the critical value at 2 df. = 5.99.

[e] *F-Test*: The critical value at (4,1623), the critical value = 2.37; at (5,1623), the critical value = 2.21.

Table 8 Panel Data: Encompassing Tests for Political Parameters (Translog)

Hypotheses	J-test stat	Result[a]	Hypotheses	J-test stat	Result	Hypotheses	J-test stat	Result
PR and CL			**CL and CL2**			**PR2 and W1**		
H0: CL with pv of PR[b]	8.90***	H_1 Î H_0	H0: CL2 with pv of CL	5.22***	H_1 Î H_0	H0: W1 with pv of PR2	5.73***	H_1 Î H_0
H1: PR with pv of CL	3.04***	H_0 Î H_1	H1: CL with pv of CL2	5.26***	H_0 Î H_1	H1: PR2 with pv of W1	8.89***	H_0 Î H_1
PR and PR1			**CL and W1**			**PR2 and W2**		
H0: PR1 with pv of PR	7.70***	H_1 Î H_0	H0: W1 with pv of CL	5.90***	H_1 Î H_0	H0: W2 with pv of PR2	5.85***	H_1 Î H_0
H1: PR with pv of PR1	3.99***	H_0 Î H_1	H1: CL with pv of W1	8.81***	H_0 Î H_1	H1: PR2 with pv of W2	6.46***	H_0 Î H_1
PR and PR2			**CL and W2**			**CL1 and CL2**		
H0: PR2 with pv of PR	8.45***	H_1 Î H_0	H0: W2 with pv of CL	5.93***	H_1 Î H_0	H0: CL2 with pv of CL1	6.64***	H_1 Î H_0
H1: PR with pv of PR2	4.83***	H_0 Î H_1	H1: CL with pv of W2	6.39***	H_0 Î H_1	H1: CL1 with pv of CL2	6.79***	H_0 Î H_1
PR and CL1			**PR1 and PR2**			**CL1 and W1**		
H0: CL1 with pv of PR	7.98***	H_1 Î H_0	H0: PR2 with pv of PR1	5.49***	H_1 Î H_0	H0: W1 with pv of CL1	5.83***	H_1 Î H_0
H1: PR with pv of CL1	4.90***	H_0 Î H_1	H1: PR1 with pv of PR2	5.76***	H_0 Î H_1	H1: CL1 with pv of W1	8.99***	H_0 Î H_1
PR and CL2			**PR1 and CL1**			**CL1 and W2**		
H0: CL2 with pv of PR	9.01***	H_1 Î H_0	H0: CL1 with pv of PR1	4.28***	H_1 Î H_0	H0: W2 with pv of CL1	5.58***	H_1 Î H_0
H1: PR with pv of CL2	5.97***	H_0 Î H_1	H1: PR1 with pv of CL1	4.46***	H_0 Î H_1	H1: CL1 with pv of W2	6.35***	H_0 Î H_1
PR and W1			**PR1 and CL2**			**CL2 and W1**		
H0: W1 with pv of PR	7.88***	H_1 Î H_0	H0: CL2 with pv of PR1	6.08***	H_1 Î H_0	H0: W1 with pv of CL2	5.99***	H_1 Î H_0
H1: PR with pv of W1	8.42***	H_0 Î H_1	H1: PR1 with pv of CL2	6.42***	H_0 Î H_1	H1: CL2 with pv of W1	8.98***	H_0 Î H_1
PR and W2			**PR1 and W1**			**CL2 and W2**		
H0: W2 with pv of PR	8.15***	H_1 Î H_0	H0: W1 with pv of PR1	5.81***	H_1 Î H_0	H0: W2 with pv of CL2	6.29***	H_1 Î H_0
H1: PR with pv of W2	5.96***	H_0 Î H_1	H1: PR1 with pv of W1	8.98***	H_0 Î H_1	H1: CL2 with pv of W2	6.85***	H_0 Î H_1
CL and PR1			**PR1 and W2**			**W1 and W2**		
H0: PR1 with pv of CL	5.06***	H_1 Î H_0	H0: W2 with pv of PR1	5.78***	H_1 Î H_0	H0: W2 with pv of W1	7.24***	H_1 Î H_0
H1: CL with pv of PR1	4.52***	H_0 Î H_1	H1: PR1 with pv of W2	6.56***	H_0 Î H_1	H1: W1 with pv of W2	1.25	H_1 accepted
CL and PR2			**PR2 and CL1**					
H0: PR2 with pv of CL	4.71***	H_1 Î H_0	H0: CL1 with pv of PR2	6.43***	H_1 Î H_0			
H1: CL with pv of PR2	4.68***	H_0 Î H_1	H1: PR2 with pv of CL1	6.34***	H_0 Î H_1			
CL and CL1			**PR2 and CL2**					
H0: CL1 with pv of CL	5.07***	H_1 Î H_0	H0: CL2 with pv of PR2	4.83***	H_1 Î H_0			
H1: CL with pv of CL1	4.87***	H_0 Î H_1	H1: PR2 with pv of CL2	4.87***	H_0 Î H_1			

Notes: *** significant at the 1% level; ** significant at the 5% level; * significant at the 10% level.

[a] where Î denotes "encompasses".

[b] pv is predicted value.

Appendix Table A1. Variable Definitions and Menmonics

	mnemonic	Definition	Source
Income	Q	GDP	WBT
Labour force	L	Labour force	WBT
Physical Capital	K	Perpetual inventory method with 5% depreciation rate	WBT
Money	M-M2	M2 money = currency + demand deposits + time and savings deposits	WBT and IFS
	M-CR	Domestic Credit	IFS
Human Capital	H-PS	Primary school enrolment rate	UNESCO
	H-SS	Secondary school enrolment rate	UNESCO
	H-PE	Public expenditure on education	UNESCO
Exchange rates, prices, PPP			PWT

Appendix Table A2. Sample Countries

Low income	Middle (low) income	Middle (high) income	High income
Bangladesh	Bolivia	Algeria	Australia
Benin	Cote d'Ivoire	Argentina	Austria
Burkina Faso	Dominican Republic	Barbados	Belgium
Burundi	Ecuador	Chile	Canada
Cameroon	Egypt	Colombia	Denmark
Central African Republic	El Salvador	Costa Rica	Finland
Ethiopia	Guatemala	Fiji	France
The Gambia	Honduras	Gabon	Germany
Ghana	Morocco	Greece	Ireland
India	Nicaragua	Jamaica	Israel
Indonesia	Papua New Guinea	South Korea	Italy
Kenya	The Philippines	Malaysia	Japan
Madagascar	Senegal	Mexico	The Netherlands
Malawi	Swaziland	Oman	New Zealand
Mali	Zambia	Panama	Norway
Myanmar		Paraguay	Spain
Nepal		Peru	Sweden
Nigeria		Portugal	United Kingdom
Rwanda		South Africa	United States
Sierra Leone		Suriname	
Sri Lanka		Trinidad and Tobago	
Tanzania		Tunisia	
Togo		Turkey	
		Uruguay	
		Venezuela	

Appendix A:

A "checklist" of factors considered to represent comprehensive political rights within an economy (specific to Gastil, 1990)

? Chief authority regularly elected by a meaningful process

? Legislature recently elected by a meaningful process; the alternatives are:[20]

(a) no choice and no possibility of rejection

(b) no choice but some possibility of rejection

(c) government or single-party selected candidates

(d) choice possible only among government-approved candidates

(e) relatively open choices possible only in local elections

(f) open choice possible within a restricted range

(g) relatively open choices possible in all elections

? Fair election laws, campaigning opportunity, polling and tabulation

? Fair reflection of voter preference in distribution of power

? Multiple political parties

? Recent shifts in power through elections

? Significant opposition vote

? Free of military or foreign control

? Major group of groups denied reasonable self-determination

? Decentralised political power

? Informal consensus; de facto opposition power

[20] These alternatives reflect variations in the extent to which political systems offer citizens or subjects a chance to participate through electoral choice. These variations were found in the course of the survey monitoring.

Appendix A:

A "checklist" of factors considered to represent comprehensive civil liberties within an economy (specific to Gastil, 1990, p. 36)

? Media/literature free of political censorship
  (a) Press is independent of government
  (b) Broadcasting is independent of government
? Open public discussion
? Freedom of assembly and demonstration
? Freedom of political or quasi-political organisation
? Non-discriminatory rule of law in politically relevant cases
  (a) Independent judiciary
  (b) Security forces respect individuals
? Free from unjustified political terror or imprisonment
  (a) Free from imprisonment or exile for reasons of conscience
  (b) Free from torture
  (c) Free from terror by groups not opposed to the system
  (d) Free from government-organised terror
? Free trade unions, peasant organisations, or equivalents
? Free businesses or co-operatives
? Free professional or other private organisations
? Free religious institutions
? Personal social rights: including those to property, internal and external travel, choice of residence, marriage and family
? Socio-economic rights: including freedom from dependency on landlords, bosses, union leaders, or bureaucrats
? Freedom from gross socio-economic inequality
? Freedom from gross government indifference or corruption.