Documentos de Trabalho

Working Paper Series

"The Electoral Dynamics of Human Development"

Vítor Castro
Rodrigo Martins

NIPE WP 06/ 2016

NÚCLEO DE INVESTIGAÇÃO EM POLÍTICAS ECONÓMICAS
UNIVERSIDADE DO MINHO

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URL:
http://www.nipe.eeg.uminho.pt/

«This work was carried out within the funding with COMPETE reference nº POCI-01-0145-FEDER-006683 (UID/ECO/03182/2013), with the FCT/MEC’s (Fundação para a Ciência e a Tecnologia, I.P.) financial support through national funding and by the ERDF through the Operational Programme on "Competitiveness and Internationalization – COMPETE 2020 under the PT2020 Partnership Agreement»

The Electoral Dynamics of Human Development[*]

Vítor Castro[♣]
University of Coimbra and NIPE, Portugal

Rodrigo Martins[♠]
University of Coimbra and GEMF, Portugal

(January 2016)

Abstract

This paper analyses the impact of elections on the dynamics of human development in a panel of 82 countries over the period 1980-2013. The incidence of partisan and political support effects is also taken into account. A GMM estimator is employed in the empirical analysis and the results point out to the presence of an electoral cycle in the growth rate of human development. Majority governments also influence it, but no clear evidence is found regarding partisan effects. The electoral cycles have proved to be stronger in non-OECD countries, in countries with less frequent elections, with lower levels of income and human development, in presidential and non-plurality systems and in proportional representation regimes. They have also become more intense in this millennium.

Keywords: Human development; Political cycles; Elections; Panel data models.
JEL classification: C33; D72; I31; O15.

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[*] The authors acknowledge helpful comments and suggestions from… Vitor Castro wishes to thank the financial support provided by the Portuguese Foundation for Science and Technology under the research grant SFRH/BSAB/113588/2015 (partially funded by COMPTE, QREN and FEDER). This paper was written while Vitor Castro was visiting the Faculty of Economics, University of Cambridge, UK. The author is grateful for the facilities provided by this University to develop his research.

[♣] Faculty of Economics, University of Coimbra, Av. Dias da Silva 165, 3004-512 Coimbra, Portugal.
University of Minho, Economic Policies Research Unit (NIPE), Campus of Gualtar, 4710-057 Braga, Portugal.
Tel.: +351239790543; Fax: +351239790514; E-mail: vcastro@fe.uc.pt

[♠] Faculty of Economics, University of Coimbra, Av. Dias da Silva 165, 3004-512 Coimbra, Portugal.
Group for Monetary and Fiscal Studies (GEMF), Av. Dias da Silva 165, 3004-512 Coimbra, Portugal.
Tel.: +351239790543; Fax: +351239790514; E-mail: rodrigom@fe.uc.pt

1. Introduction

The existing literature on political cycles has typically focused on the economic policy activity of governments. It is assumed that policymakers have strong incentives to align policy measures with the timing of elections or/and with the electorate's partisan preferences. As such it is expected that the economy exhibits clear economic cycles that closely track the electoral calendar. One fundamental assumption behind all politico-economic models is that voters prefer those candidates that can deliver them greater well-being. However, behind this hypothesis there is another one very well-known across all areas of economics: when we improve agents' economic prosperity, we deliver them more well-being. This Maslow-based view of people's needs puts economic concerns before any others, considering that the financial well-being is the only necessary condition for general well-being but, nevertheless, recognizing that it is not a sufficient condition. More so in cases where people's basic economic needs are satisfied, like for most individuals in prosperous democracies.

It is well known that data about GDP, income, unemployment, inflation, public debt and other macroeconomic aggregates does not provide information about all the important preferences of their real beneficiaries. Economic agents frequently value achievements such as better education and health services, broader participation in economic, cultural and political activities of the local community, improvements in working conditions and security against crime and physical violence, that are not necessarily reflected in higher income, output growth or aggregated public accounts. Hence, it seems sensible to consider other dimensions of development, instead of simply looking at economic variables, to draw the complete picture of democracy's effect on people's lives. In this paper, we try to move closer to the idea that governments supply more than economic well-being in exchange for

votes and try to find evidence that the political cycle is not limited to the economic dimension, and thus putting empirical research a step closer to the reality.

Contrary to economic growth, that is simply related to quantitative changes in a country's economy, economic development involves quantitative and qualitative changes in a country and reflects not only economic and technological progress but also social relations, health conditions, education standards, personal safety and social progress. It is a broader measure of key determinants of human well-being. However, defining and measuring economic development is not straightforward. Several alternatives have been developed to measure it combining a few indicators of economic development (Fleurbaey, 2009). The most commonly accepted is the Human Development Index (HDI), which was developed by the United Nations Development Program (UNDP) in 1990. This is a broad measure that covers multi-dimension aspects of economic development, especially, education, health and income (Sen, 1999).

This study represents a first attempt of exploring the electoral dynamics of well-being, taking the advantage of using a broad human development indicator that encompasses not only the economic, but also social dimensions of a society. This will allow us to answer the forgotten question of whether and how human development is affected by political motives and electoral calendars in both developed and developing countries.

To proceed with this analysis, we use data over a panel of 82 countries during the period 1980-2013 to test for the presence of political cycles, partisanship, and government support effects on the growth rate of human development. A GMM estimator is employed in the empirical analysis and the results unveil the presence of political cycles in the human development: during election years human development tends to accelerate. Majority governments also exert a significant effect on it, but no evidence is found regarding partisan effects. Moreover, these political cycles are especially observed in developing countries,

with lower income and lower levels of HDI, and in countries with less frequent elections. Additional evidence shows that they have become more intense in this millennium. Presidential and non-plurality systems and proportional representation regimes are also characterized by stronger political cycles.

This article is organized as follows. Section 2 presents a brief review of the relevant literature. Section 3 describes the data and presents the econometric model. The main results are presented and discussed in section 4. Some robustness checks are provided in section 5 and section 6 concludes.

2. Literature review

Measuring economic development and evaluating its behaviour to changes in economic, social, institutional and political variables has become an important task of several recent theoretical and empirical researches. Many studies have tried to construct measures of well-being. Fleurbaey (2009) summarizes three main approaches: adjusted GDP, happiness indices, and the Human Development Index.

The adjusted GDP approach is based on welfare economics and aims to derive indicators of change in social welfare focusing on the intertemporal dimension of social welfare (Dasgupta, 2001). In practice, this approach relies on capital stocks as the drivers of changes in the intertemporal well-being of individuals. However, although theoretically appealing, it suffers from practical implementation problems (difficulties of generating comparable measurements across countries) and conceptual weaknesses (it is based on the theory of revealed preference). The happiness approach – which is based on evidence from surveys on well-being (Frei and Stutzer, 2002) – also suffers from serious problems of comparability across time and space.

The Human Development Index (HDI) has been considered a more consensual measure of social welfare. Indeed, the 1990 Human Development Report and the seminal research by Fukuda-Parr and Shiva-Kumar (2003) have set the stage for much of the subsequent investigation that followed. According to the Human Development Report (UNDP, 2014), this is a summary index (geometric mean) of three essential dimensions of human development: (*i*) long and healthy life; (*ii*) access to knowledge and education; and (*iii*) decent and stable living standards. Consequently, several authors emphasize the main features of this indicator. Ul Haq (1995) notices that it measures well-being and not just income by including both economic and social dimensions of well-being; additionally, its coverage and methodology is flexible enough to allow a measure of multi-dimensional well-being. Alkire (2007), Comim et al. (2008) and Molina and Purser (2010) also point out that the HDI allows for simple, replicable and comparable cross-country and within-country measures of human development.

The HDI also presents some limitations such as weighting different aspects of life in the same way for all individuals, difficulties in comparing countries by other factors like the quality of schools or dropout rates, and the fact of the index values range between 0 and 1 which may not well reflect the differences between countries. Nevertheless, its practical advantages over the alternatives make it preferable is most empirical applications. Nafziger (2012) considers it as a better, more complete and multifaceted measure of human development than any other indicator or index, being useful for the qualitative aspects of development. Several studies, in different fields, have used the HDI as a measure of economic development and to test how it reacts to changes in important economic, social and political variables. For example, Ranis et al. (2005) show that child mortality is highly correlated with HDI; Timmer and Akkus (2008) assess the gender determinants of long-term human development; Wolfers (2009) finds that income per capita is highly

correlated with HDI ranking;[1] Davis (2009) and Martins and Veiga (2014) analyzes the effects of government size and the composition of public expenditure on economic development.

This paper analyzes the existence of democracy related effects on the human development, with a special focus on the impact of elections and of government ideology. Due to the advantages discussed above, we use the HDI as the measure of choice to investigate the presence of politically induced development cycles.

The analysis of political cycles has essentially focused on the economic sphere, i.e. variables like GDP, unemployment, inflation and other macroeconomic variables – along with fiscal and debt formation variables – have been scrutinized in the search for electoral, partisan and other democracy related effects (see, Franzese (2002) for an encompassing survey). The political business cycles and partisan theories are the main theoretical frameworks that indicate how governments affect macroeconomic outcomes. The political business cycles theories (PBC) are divided into models that assume agents with adaptive expectations (Nordhaus, 1975) and more recent models that adopt rational expectations (Rogoff and Sibert, 1988; and Rogoff, 1990). The main implication of these models is that all politicians implement expansionary economic policies before elections with the objective of maximizing their electoral support and afterwards contractionary measures are required to correct the artificial unbalance generated previously[2]. If the objective of governments is to produce more economic well-being in order to generate more votes, we can easily extend the PBC theory to include social dimensions. Development features like

[1] Bloom and Friedman (1997), Bloom and Williamson (1998) and Bloom et al. (2003) also show that the drop in the economic dependency ratio has an impact on how human development evolves over time.

[2] Rational versions of opportunistic models tend to reduce the ability of policymaker's to induce the political cycle. Empirical studies suggest that favourable economic conditions do benefit governments (Hibbs, 2006). However, opportunistic behaviour appears to gather more support in developing countries (see, for instance, Shi and Svensson, 2002a,b, 2006; Brender and Drazen, 2008; and Vergne, 2009).

better health and education along with other social protection and personal aspects of people's lives should improve near elections. Short-term policy shifts like increases in expenditures in these areas can generate the typical post electoral downturn after elections described by the theory. Studies like Blais and Nadeau (1992), Potrafke (2010), Enkelman and Leibrecht (2013) and Castro and Martins (2016) report the presence of PBC cycles in some welfare related expenditures.[3] However, part of the development relies on structural policies, for which the post-electoral effect is hard to achieve. Nevertheless, we can assume that some structural non-economic shifts that take longer to come in effect can be timed by competent governments in order to produce at least some effects near elections.

Alternatively to the PBC theories, both the adaptive (Hibbs, 1977) and rational (Alesina, 1987, 1988; Alesina and Sachs, 1988) versions of the partisan theory view politicians as heterogeneous, arguing that different parties have different policy objectives, behaving, when in office, in a partisan manner. Left-wing parties are relatively more concerned with unemployment (growth) than with inflation, whereas right-wing parties are especially worried with inflation control.[4] The effect of partisanship on the development of the welfare state has been widely debated and non-economic dimensions of State intervention like some welfare policies such as health, education and social protection have been considered (see Imbeau et. al. (2001) for a meta-analyses on the relationship between party ideology and government policies). Overall, the traditional assumption behind partisan effects is that left parties tend to promote the welfare intervention by the State, while right-wing governments are negatively correlated with State involvement in welfare.

[3] Veiga and Veiga (2007), Drazen and Eslava (2010), Aidt et al. (2011) and Sakurai and Menezes-Filho (2011) also found political opportunism at aggregated and disaggregated levels of public expenditures but restricted to the municipal level of government.

[4] In general, empirical evidence points out that partisan behaviour seems to be more recurrent in developed countries (see Alesina et al., 1992, 1997).

Left governments are assumed to want more state presence in people's lives and are also bigger spenders than right-wing parties. Hence, they are expected to be better providers of education, health and social security.[5] However, Wilensky (1976) claims that there is a process of cross national convergence regardless of ideological concerns, arguing the industrialized countries report similar welfare states as a consequence of their similar levels of economic performance.

As far as we are concerned, the presence of political cycles has never been tested in any indicator of human development. Nevertheless, some aspects of the relationship between human development and political systems have been analysed. For example, Gassner et. al. (2006) found that countries that have proportional systems tend to enjoy higher levels of human development, when compared to those with majoritarian systems. Also, Miller (2015) shows that the existence of elections in autocratic regimes matters for human development: autocratic regimes with legal multiparty elections seem to outperform regimes without elections with respect to a wide range of human development outcomes.

3. Data and model specification

To analyse the presence of political cycles in the human development, we collected annual data for 182 sovereign states over the period 1980-2013. However, the presence of missing values for some variables, mainly for developing countries, reduced the number of countries to at most 82.[6]

The dependent variable in this analysis is the growth rate of the Human Development Index (*HDI_gr*). The HDI is a measure of the average achievement in key dimensions of human development, namely: (*i*) a long and healthy life; (*ii*) being

[5] Studies that take a look at disaggregated public expenditures found none or weak support for partisan effects in welfare related areas. See, for instance Enkelman and Leibrecht (2013) and Castro and Martins (2016).

[6] The countries used in this study are listed in Table A.1 in Annex.

knowledgeable; and (*iii*) a decent standard of living. This index is the geometric mean of normalized indices for each of those three dimensions. The data for those indices and HDI are provided by Human Development Report of the United Nations Development Programme (UNDP, 2014).[7]

The explanatory variables included in the baseline model are the lag of *HDI_gr* (to account for the persistence in the adjustment), the set of the political variables of interest and some economic, institutional and demographic controllers. The political variables are provided by the Database of Political Institutions 2012 and by the Comparative Political Data Set I 2013, and are described as follows:

- *Elect_yr*: a dummy variable that takes de value of 1 in the year of legislative elections; and 0, otherwise. A positive sign is expected for its estimated coefficient, meaning that political cycles are present in the growth rate of Human Development.
- *GovLeft*: a dummy variable that takes de value of 1 when there is hegemony or dominance of left-wing parties in the cabinet; and 0, otherwise (centre or right-wing parties). Our expectation is that left-wing governments are more concerned with Human Development than their centre or right-wing counterparts.
- *GovMaj*: a dummy variable that takes the value of 1 when a single party or coalition has majority in the parliament; and 0, otherwise. Majority governments have enough support to promote development measures; however, the power they have to

[7] For details on how the HDI is computed, see Table A.2 in Annex and the Technical Notes of the Human Development Report. As the data for HDI and its three components (Life Expectancy, Education and Income indices) are only available for periods of five years between 1980 and 2000, the missing data were obtained by linear interpolation for each of the three components (more recent data are provided annually); then the HDI was computed as the cubic root of the product of those three components for the entire time period (1980-2013). A direct linear interpolation of HDI was also considered, as well as cubic and natural cubic spline interpolations, in some robustness checks (and shorter time periods: 1990-2013, 2000-2013, 2005-2013). However, independently of the kind of interpolation and time period used, the results and conclusions of this study remain unchanged.

favour their own agenda and interests may not be favourable to human development, so no clear sign is anticipated for the coefficient on this variable.

- *GovCoal*: a dummy variable that takes the value of 1 when a coalition government is in office, regardless of having majority or not; and 0, otherwise. It is also difficult to anticipate a sign for its coefficient, as different interests may delay important measures or generate a consensus for the need of their implementation.
- *MajCoal*: a dummy variable that takes the value of 1 when a majority coalition government is in office; and 0, otherwise. It is equal to *GovMaj*GovCoal*. Once again, for the reasons indicated above, it is not easy to foresee the direction of its impact on *HDI_gr*. However, this is another important political dimension to be considered in this analysis.

The additional set of variables includes controllers for the rating risk at economic, financial and political levels and for population growth. The data for the risk of rating variables comes from the International Country Risk Guide (ICRG) and the population data is obtained from the World Development Indicators. The variables are defined as follows:[8]

- *EcoRating*: the economic risk rating is obtained by a weighted average of information on GDP per head, real GDP growth, annual inflation, budget balance over GDP and current account over GDP. The aim of this index is to provide compiled information on the general economic environment, strengths and weaknesses. A higher value for this index represents a better and strength economic environment, which is expected to have a positive impact on human development.[9]

[8] An increase in the economic, financial or political rating risk index means an improvement in the respective rating risk, i.e., that the economic, financial or political environment has improved.

[9] We prefer to control for the impact of the economy using this indicator instead of GDP or income per capita or other related variable. As one of the components of the HDI is precisely an income index, using those variables as regressors would certainly be highly correlated with HDI.

- *FinRating*: The financial risk rating index includes foreign debt as a percentage of GDP, foreign debt service as a percentage of exports of goods and services, current account as a percentage of exports of goods and services, net international liquidity as months of import cover and exchange rate stability. The aim of this risk rating is to provide a means of assessing a country's ability to pay its obligations and to finance its official, commercial, and trade debt obligations. We also expect that a better rating will mean higher development.
- *PolRating*: the political risk rating includes 12 weighted variables covering both political and social attributes.[10] Its aim is to provide a means of assessing the political stability of the countries on a comparable basis. We conjecture that a better rating has a positive impact on human development.
- *Pop_gr*: growth rate of total population. As a high population growth brings an increased pressure on the management of natural resources and over the socio-economic relations, we believe that it may also be detrimental for the growth rate of human development.

The descriptive statistics for these and other related variables – that will be considered in some additional specifications/experiments – are reported in Table A.3 in Annex. To estimate the impact of those variables on the growth rate of the human development index, we consider the following dynamic panel data specification:

$$HDI\_gr_{it}=\alpha+\rho HDI\_gr_{it-1}+\boldsymbol{\beta Pol}_{it}+\boldsymbol{\gamma Rating}_{it}+\delta Pop\_gr_{it}+\theta Time_t+v_i+e_{it} \qquad (1)$$

[10] The 12 components are: government stability, socioeconomic conditions, investment profile, internal conflict, external conflict, corruption, military in politics, religious tensions, law and order, ethnic tensions, democratic accountability, and bureaucracy quality. For details, see ICRG at http://www.prsgroup.com.

where i=1,…,82 and t=1981,…,2013. ***Pol*** and ***Rating*** represent, respectively, the vectors of the political and risk rating variables. The coefficient on the lag of the dependent variable (ρ) measures its persistence. The vector $\boldsymbol{\beta}$ captures the impact of the electoral cycle, partisan and government support effects on *HDI_gr*, while the vector $\boldsymbol{\gamma}$ assesses the effect of the economic, financial and political environment controllers. The impact of population growth is given by the coefficient δ. Additionally, we also control for the passage of time by including the *Time* variable in the specification. Regarding the last components, v_i is the individual effect of each country i, and e_{it} is the error term.

Given the presence of individual effects v_i, the model can be estimated assuming those effects as fixed or random. However, the lagged value of the dependent variable would be correlated with the error term, even if the latter is not serially correlated. This implies that OLS estimates (random or fixed effects) will be biased and inconsistent (Baltagi, 2008). Although the fixed effects (FE) estimator gains consistency as the number of time periods increases, the time-series dimension in this analysis might not be large enough (T=33) for us to rely entirely on its estimates.[11]

The estimators that take into account that bias can be grouped into: (*i*) bias-corrected estimators; and (*ii*) instrumental variables estimators. Bias-corrected estimators, like the one proposed by Bruno (2005a, b) – the bias-corrected least squares dummy variable estimator (LSDVC) for dynamic panel data models – are suitable when the number of individuals (N) is small (and T is not large enough). Although T is not large in this study, the number of individuals cannot be considered small (N=82). Hence, this estimator may not be the most suitable procedure to solve the bias problem caused by the inclusion of the lag of the dependent variable in the list of regressors.

[11] Judson and Owen (1999) notice that even for T=30 the bias can be as much as 20% of the true value of the coefficient of interest.

According to the large sample properties of the generalized method of moments (GMM), the dynamic estimator proposed by Arellano and Bond (1991) is adequate when there is a clear dominance of cross sections over time periods in the sample. This is what happens in our panel, which means that this estimator is a more appropriate procedure to solve the bias problem. Taking first differences of equation (1), levels of the explanatory variables can be used as instruments to avoid correlation between lagged dependent variable and the country-specific effects.[12] Arellano and Bond (1991) also proposed a variant of the GMM estimator, namely the two-step estimator, which utilizes the estimated residuals in order to construct a consistent variance-covariance matrix of the moment conditions. Although the two-step estimator is asymptotically more efficient than the one-step estimator and relaxes the assumption of homoscedasticity, the efficiency gains are not that important even in the case of heteroscedastic errors. This result is supported by Judson and Owen (1999), who showed empirically that the one-step estimator outperforms the two-step estimator, especially when the number of time periods is relatively high (T=30), which is the case in this study.

Arellano and Bover (1995) and Blundel and Bond (1998) suggest another GMM estimator with additional moment conditions. If they are valid, they will increase the efficiency of the estimators. This is known as the system GMM estimator, which combines the moment conditions of the model in first differences with those of the model in levels (differences are used as instruments for the level equations). However, if the orthogonality conditions for the first-difference equation are valid, but those for the level equation are not, then the system GMM may not be better than first-differences GMM. This can happen, for example, if the regressors used in the orthogonality conditions for the levels equation

[12] For this difference in GMM estimator to be consistent, it must be ensured that there is no autocorrelation in the errors and no correlation between individuals in the residuals. The passage of time is considered in the specification to overcome this problem.

are correlated with the individual effects. Moreover, simulations suggest that the system GMM is not necessarily superior to the standard GMM in cases where the autoregressive parameter is below 0.8 and the time-series observations are relatively large (Blundell and Bond, 1998; Moshirian and Wu, 2012). This is what we observe in our data, so the estimator that seems to be more suitable for our empirical analysis is the one-step first-differences GMM estimator.

Another problem that we have to deal with is the "too many instruments problem". Using too many instruments may result in over-fitting biases. When the number of time periods is relatively large, this over-fitting becomes even more serious. The consequent large collection of instruments, even if individually valid, can be collectively invalid because they over-fit endogenous variables (Doornik et al., 2002; Roodman, 2009a, b). They also weaken the Hansen test of overidentifying restrictions used to check instrument validity. Hence, to minimize the over-fitting problem we use the collapse alternative suggested by Roodman (2009b). The empirical results from this panel data analysis are presented and discussed in the next section.

4. Empirical results

The findings of this study are reported and carefully discussed in this section. We start by considering several alternative estimators; then we dig deeper on the timing of elections and its frequency; the distinction between developed and developing countries and political systems is taken into account next; and some robustness checks are provided at the end of this section.

4.1. Initial estimates

The results from the estimation of our baseline model are presented in Table 1. We report not only the results from the one-step and two-step differences and system-GMM estimators, but also the FE and LSDVC estimators (all with robust standard-errors). Despite our choice goes to the one-step differences-GMM estimator – for the reasons explained above – we consider a good practice, at this stage, to report the results of the other "competing" estimators. This is relevant not only to show their differences, but also – and more importantly – to emphasize the consistency of our main results.

[Insert Table 1 around here]

Looking first at the results provided by our preferred estimator (column 1), we observe that during election years the growth rate of human development is significantly higher (around 0.05 percentage points) than in non-election years.[13] This means that the traditional political (business) cycles observed in GDP growth and public accounts/expenditures are also present in this broader dimension of well-being. This is a striking finding in the way it reveals the existence of an electorally determined cycle, thus highlighting the role of democratic features in shaping the growth path of human development. Nevertheless, the political orientation of the government seems to be innocuous for that path: left-wing governments are not more prone to promote human development than centre or right-wing parties. But majority governments (forming a coalition or not) have a marginal negative impact on the growth rate of human development, perhaps because they can set their own agenda without the need of reaching a

[13] Even though the magnitude of this effect seems small, we should note that, on average, the HDI grows very slowly over time. Hence, we cannot expect higher magnitudes for the estimated coefficients.

broader consensus from other parties, which ends up having a negative effect on general well-being.

As expected, another important result to emphasize is that the economic environment matters for human development: an improvement in the economic risk rating is immediately reflected on the path of human development. However, general financial and political enhancements and population growth have not proved to play a significant role in terms of well-being. Interestingly, the growth rate of human development has shown to decrease over time, which indicates lower improvements in the general human development in the more recent years.

These findings are robust to the choice of the kind of GMM estimator (one-step or two-steps; differences or system), but the system-GMM estimator has proved not to fit very well to the data. Contrary to the differences-GMM estimator,[14] no persistency is found and the Hansen and differences-in-Hansen tests reject the validity of the instruments and the additional moment restrictions. Moreover, the main findings are also robust to the use of biased/inconsistent fixed effects estimators (static and dynamic – see columns 5 and 6 in Table 1), which might indicate that the bias can be negligible. In fact, correcting the bias with the LSDVC estimator does not generate significantly different results.[15] Nevertheless, for the reasons indicated in the previous section, we proceed our analysis employing the one-step robust standard errors differences-GMM estimator.

[14] The differences-GMM estimator requirements are fulfilled as the Hansen tests does not reject the validity of the instruments and there is autocorrelation in the first order but not of second order.

[15] In the LSDVC regressions, we employ the Arellano and Bond (1991) estimator as the initial estimator, collapsing the instruments as suggested by Roodman (2009a, b). Following Bloom et al. (2007), we undertake 50 repetitions of the procedure to bootstrap the estimated standard errors. Nevertheless, results do not qualitatively change with different repetitions (25, 100 or even 200).

4.2. Elections timing, political orientation and support, and institutional issues

In the following set of experiments we test the sensitivity of our results to changes in the political variables, in the controllers and to cross effects between the variables. The results are presented in Table 2. We start by exploring the political cycle in greater depth, focusing on the timing of the elections (columns 1-3). In a first approach, we check whether the government's behaviour starts to exert any significant effect on human development before election years. Thus, we add to the equation a dummy variable that takes the value of one in the year before the elections (*BefElect_yr*). The results show that the electoral cycle over the growth rate of HDI is only present in election years, and not before.

[Insert Table 2 around here]

Next, we replace the *BefElect_yr* and *Elect_yr* variables by a dummy that takes de value of one in the year after the elections, and 0 otherwise (*AftElect_yr*). We found this effect to be statistically non-significant, therefore, we reject the presence of a full or complete opportunistic cycle in the data.

Additionally, instead of using dummies to control for the electoral period, we employ a variable that controls for the timing of the elections by measuring the proportion of time that has elapsed since the last election, i.e. it measures the proportion of time a government is in office in a particular year, since it has been elected (*TimingElect*).[16] The results are consistent with the idea that policymakers behave opportunistically: as elections approach they manipulate fiscal policy to improve welfare and well-being of their constituents in order to increase their support and maximize their chances of winning the elections. Regarding the other variables, the results remain unchanged.

[16] It is equal to 1 in the election year.

In the following experiments the other variables are replaced by some proxies. The dummy *LeftGov* is replaced by *RightGov* (which takes value one when a right-wing party is in office; 0 otherwise). Majority and coalition dummies are also replaced by the fraction of seats held by the government (*Maj%*, which is calculated by dividing the number of government seats by the total number of seats in the parliament). However, no significant coefficients are found for those proxies.

Even though the political risk rating is never statistically relevant, we decided to test some of its components or related variables. Hence, in columns (6), we present the results with those that proved to be significant: the degree of democracy (*Democracy*, which is an index that represents a polity scale ranging from -10 to +10, i.e. strongly autocratic to strongly democratic; it is the '*polity2*' variable in the Polity IV Database); and a corruption index (*Corruption*, which is published by the ICRG and ranges from 1 to 5, i.e. low corruption to high corruption). The results are in line with our expectations, since more democracy and less corruption are beneficial for human development.[17] However, the effects of these institutional components of the political environment have not proved to be consistent. For example, when we add a variable to control for the size of government (*GovSize*) their statistical significance vanishes. Moreover, the size of government also appears not to influence the growth rate of human development in the group of 55 countries for which the data is available.[18]

In column (8) we report a regression with a composite risk rating (*CompRisk*) computed using the economic, financial and political risk rating variables. This composite rating is computed by the ICRG. The political risk rating contributes 50% of the composite

[17] Aidt (2011) provides evidence of a negative impact of corruption on sustainable development.

[18] *GovSize* is the '*fi_sog*' index in the Economic Freedom of the World published by the Fraser Institute. Despite those effects are not relevant in our sample, Martins and Veiga (2014) have found a significant impact

rating, while the financial and economic risk ratings each contribute 25%. The results indicate that the better the general economic, financial and political environment is, the more the human development grows. However, we can easily conclude that this effect is mostly due to improvements in the economic conditions.

In general, despite all these experiments, our main findings remain valid: elections and economic environment have a positive impact on the growth rate of human development, while majority governments tend to exert a negative influence. Additionally, to account for the possibility of the risk rating variables not being exogenous, we treat them as endogenous in the last regression in Table 2. Nevertheless, our results are not affected.[19]

4.3. Frequency of elections

Another important issue to be considered in this analysis is whether the frequency of elections can affect the political cycle in the human development. Are longer cycles responsible for more opportunism than shorter cycles? Can human development benefit from low or high frequency elections? What 'kind of democracy' might be better? To get some clues on how to answer these complex questions we have to find a way of identifying countries with different frequencies of elections. The most practical way is to divide them according to the average duration of mandates: one with low durations (high frequency); the other with high durations (low frequency).

The next challenge is to define the threshold between high and low frequencies. A very straightforward solution is to consider the average duration among the panel of

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of government size on human development in a larger panel of 156 countries and using a convergence specification with 5-year time spans. Our sample only includes countries with established democracies.

[19] We also tried to test for the presence of interaction effects between *Elect_yr* and *GovLeft*, *GovMaj* and *EcoRating*, but the respective coefficients were always statistically insignificant. Those results are not reported here to save space, but they are available upon request.

countries used in our analysis: 3.8 years.[20] Thus, we can estimate one model for the group of countries that present a high frequency of elections (average duration of mandates lower that 3.8 years), and other for the group with a lower frequency of elections (duration higher or equal to 3.8 years). The respective results are presented in columns (1) and (2) in Table 3. They are very clear in pointing out that political cycles are a characteristic of countries where governments' mandates are longer.[21] These provide the necessary time for policymakers to develop and implement the (opportunistic) measures that will promote a significant increase in well-being, precisely when they need to maximize their political support, i.e. in the election years. As longer mandates are mainly a consequence of political stability, our results indicate that more politically stable democracies seem to be more prone to opportunistic manipulation. This is also consistent with the notion that some development measures are not short-term based, thus requiring more time to be implemented.

[Insert Table 3 around here]

This finding is confirmed when we run a regression with all countries but distinguishing elections in countries where they are more frequent (multiplying *Elect_yr* with the dummy *MoreFreq* that takes the value of one in countries with an average duration

[20] Another option could be to consider differences in the constitutional duration of terms in each country. However, we would face the problem that, in general, they are not very different (they are usually set at four years, which is indeed quite close form the average of 3.8 years), so we will have almost all countries in only one group; moreover, there are several cases in which mandates end up being shorter than expected because governments have not enough political support to stay in office. Thus, due to these practical issues, we opted by using the average threshold.

[21] For the countries in each sub-sample see Table A.1 in Annex. As the number of countries is low when we split the sample, an LSDVC was also used. The results have proved to be very similar; they are not presented

of mandates lower than 3.8 years: *Elect*MoreFreq*) from elections in countries where they are less frequent (multiplying *Elect_yr* with the dummy *LessFreq* that takes the value of one in countries with an average duration of mandates higher than 3.8 years: *Elect*LessFreq*). We also test whether the difference in the coefficients is significant (*Diff_ElectFreq*). Even though the difference is not statistically significant, only countries where governments have longer mandates present a significant political cycle on human development. This same conclusion is obtained if we replace *Elect_yr* by *TimingElect* and multiply it by *MoreFreq* (*Timing*MoreFreq*) and *LessFreq* (*Timing*LessFreq*).

These results have also proved to be robust to small changes in the threshold. We tried other *ad hoc* thresholds at 3.5, 3.6, 4, and 4.2 years but the results described above remained qualitatively unchanged.[22] We also report the results using as threshold for the frequency of elections the mean duration of mandates observed in the sub-group of OECD countries (i.e. 3.4 years – see columns 5-8), which are also the most developed countries in our sample. The results are in line with the ones reported above, pointing out to a clear political cycle in the countries with less frequent elections (i.e. frequency higher than 3.4 years). In this case, we are able to unveil a significant difference between the two groups of countries when the variable *TimingElect* multiplied by the dummies for the frequency of elections is employed.

An additional and striking finding that emerges from this analysis is that majority governments are especially detrimental for human development in countries with a high

here to save space, but they are available upon request. Note that regression (3) in Table 3 is another way of checking the consistency of the results, while keeping the entire sample.

[22] At 4.5 years, the significance for countries with less frequent elections decreases; however, the number of countries in that sub-sample also decreases dramatically. All mentioned results are not reported here, but are available upon request.

frequency of elections (see columns 1 and 2).[23] This might mean that as their expected time horizon in office is shorter, they will tend to look at their short-term interests in detriment of 'building' more long-term policies associated with non-economic aspects of development. Apart from the fact that economic environment matters for human development in any of the cases, no other relevant results are found. Nevertheless, there may be some results found in this subsection that are potentially tied to the characteristics of the political systems. As political systems features are constant over our time span and, therefore, cannot be controlled for in the previous estimations, in the next subsection we pay a close attention to the impact of different political designs on human development.

4.4. Advanced vs developing economies and political systems

The literature on political business cycles has demonstrated that the opportunistic behaviour tends to gather more support in developing countries than in advanced economies (Shi and Svensson, 2006; Brender and Drazen, 2005, 2008; Vergne, 2009). To account for this issue in the human development, we separate the analysis in two sub-groups of countries: OECD countries (representing the advanced economies); and non-OECD countries (encompassing all the other less developed or developing economies). Moreover, we also distinguish high-income countries (HIC) from countries with lower income (LIC) and between countries with a high-HDI (HHDIC) and low-HDI (LHDIC).[24] The results are presented in Table 4.

[23] This finding is observed when we use the 3.8 years threshold but not with the 3.4 years threshold, maybe because in the second case the number of majority government is residual.

[24] For the countries in each sub-sample see Table A.1 in Annex. High-income countries are those are those that, according to the World Bank in 2014, have a GNI per capita of $12,736 or more. For the high-HDI group are considered those countries that, according to the United Nations Development Program, have an HDI higher than 0.800.

[Insert Table 4 around here]

The results for the group of OECD countries are shown first, followed by the ones for non-OECD or less developed economies (see columns 1 and 2). Despite economic conditions being important in both sub-sets, we corroborate the idea that governments' opportunistic behaviour is a characteristic of less developed countries. In particular, human development rises more significantly during election periods in those economies than in more advanced ones. The effect in the OECD countries is almost negligible. When dummy variables are used to identify the two sets of countries and multiplied by *Elect_yr* (*Elect*OECD* and *Elect*NonOECD*) – in a similar way to what we have done in Table 3 for the frequency of elections – we confirm the prominence of political cycles in the human development for non-OECD economies and that the difference to the group of OECD countries is statistically significant (see coefficient on *Diff_OECD*).

Identical approaches are used in the distinctions regarding income and HDI. The results reported in columns (4) to (9) are in line with the previous ones, in the sense that they show that countries with lower income and HDI are the ones in which the timing of the elections matter for the evolution of human development, with a significant difference relatively to the other groups (HIC or HHDIC).[25] On the contrary, majority governments' behaviour seems to be detrimental to human development only in countries with a higher income and HDI.

[25] The *HIC*, *LIC*, *HHDIC* and *LHDIC* variables in the specifications (multiplied by *Elect_yr*) are dummies that take the value of one if a country belongs to that group (the differences between the respective coefficients are given by *Diff_IC* and *Diff_HDI*). An LSDVC estimator was also used for each sub-sample, but the results did not change. They are not shown here to save space, but they are available upon request.

The type of political regime/system may also play a role on how human development behaves.[26] Issues like whether the system is presidential or not, whether there is plurality or not, and whether there is proportional representation or not deserve to be considered as different political systems can generate different outcomes. As these characteristics of the electoral design do not exhibit time variability we cannot explicitly include them in the model to control for their impact, because they are dropped in the GMM estimations. Thus, the alternative is to estimate separate regressions for each kind of political system/regime. Additionally, we can also evaluate the significance of the differences in the political cycle behaviour (*Diff_#*) by looking at the impact of the product between *Elect_yr* and a dummy for the respective regime (*Elect*Presid* and *Elect*NonPresid*; *Elect*Plural* and *Elect*NonPlural*; *Elect*PR* and *Elect*NonPR*), in a similar way to what we have done above.[27] The results for the respective estimations are presented in Table 5.

[Insert Table 5 around here]

Presidential and non-plurality regimes and proportional representation systems are the ones in which human development exhibits an electoral cycle. These results are in line with the works of Persson and Tabellini (2002) and Gassner et. al. (2006). However, the difference for their counterpart systems/regimes has not proved to be very relevant (see

[26] For example, Persson and Tabellini (2002) and and Gassner et. al. (2006) show that electoral cycles differ across political systems.

[27] *Presid* takes de value of one in presidential systems, i.e. when the head of government is also head of state and leads an executive branch separated from the legislative branch, and 0 otherwise (*NonPresid*). *Plural* takes the value of one in plurality systems, i.e. when legislators are elected using a 'winner-take-all' rule, and 0 otherwise (*NonPlural*). *PR* takes the value of one in proportional representation regimes, i.e. in those regimes in which candidates are elected based on the percent of votes received by their party, and 0 otherwise (*NonPR*). For details on the countries in each system/regime, see Table A.1 in Annex.

coefficients on *Diff_#*, for each case) and partisan effects remain absent from all estimations.

We also verify that despite economic conditions matter independently of the kind of political system/regime, majority governments tend to be more "active" in non-plurality systems and in proportional representation regimes.

4.5. Robustness checks

As the data for HDI and its three components (Life Expectancy, Education and Income indices) are only available for periods of five years between 1980 and 2000, the missing data were obtained by linear interpolation for each of its three components. The HDI was then computed as the cubic root of the product of those three components for the entire time period (1980-2013). To check for the robustness of our results, we present some additional regressions where different kinds of interpolations to obtain the missing values for HDI are used, as well as different time periods. The results are presented in Table 6.

[Insert Table 6 around here]

As the evolution of HDI and its components follows a relative stable and smooth path, the linear interpolation seems to be a reasonable option. Thus, despite our preferable choice of indirect linear interpolation used above, a direct linear interpolation of HDI series was also considered (see column 1 in Table 6). Additional regressions with cubic and natural cubic spline interpolations for the missing values of HDI are provided (see columns 2 and 3). To circumvent any remaining issues with interpolation, we also report estimations for shorter and more recent time periods (where fewer years are interpolated or where there is no interpolation at all): 1990-2013, 2000-2013, and 2005-2013 (see columns 4 to 10).

Independently of the kind of interpolation or time period considered, the results and conclusions of this study remain unchanged. Despite the estimates with different kinds of interpolation do not offer any further insights, something more can be said regarding the cases in which we restrict the time period. First, for the period after 2004 no persistence is found, so a FE estimator is considered in regression (7). Second, the magnitude of the coefficient on *Elect_yr* increases as we restrict the time period to more recent years, which points out to an intensification of political cycle over time. Third, this effect is concentrated in the group of non-OECD (or less developed) countries, as shown in column (8). Lastly, regressions in columns (9) and (10) not only confirm that the political cycle on human development have become stronger in the recent years, but also show a significant difference relatively to the previous periods (before 2000 and before 2005).[28]

In sum, we find consistent evidence that policymakers' opportunistic behaviour encompasses some social concerns, which has contributed to boost human development, especially in developing (or less developed) countries, a phenomenon that has become more intense in this millennium.

5. Conclusions

This study represents a first attempt of analysing the role of democratic features in the shaping of human development's growth path. The traditional analysis of political cycles has focused essentially on the business or economic cycle, and assumes that governments are only interested in providing economic well-being, thus neglecting other relevant dimensions that economic agents tend to value like better education and health services, broader participation in economic, cultural and political activities of the local

[28] See the coefficients on *Diff_DYr00* and *Diff_DYr05*, where *DYr00* is a dummy that takes the value of one in the years after 1999 (it is the same as *DYr>1999*), and 0 otherwise (*DYr<2000*); and *DYr04* is a dummy that takes the value of one in the years after 2004 (it is the same as *DYr>2004*), and 0 otherwise (*DYr<2005*).

community, improvements in working conditions and security against crime and physical violence. Since the HDI, developed by the United Nations (UNDP), covers multi-dimension aspects of economic development, we use it to analyse the electoral dynamics of human development.

Using data for 82 countries over the period 1980-2013 and employing a GMM estimator we were able to identify the presence of a political development cycle. During election years the growth rate of human development is significantly higher than in non-election years. It seems that governments near elections deliver more than strict economic well-being, and thus the standard economic cycle found in the literature is only a part of the actual socio-economic cycle generated by elections. We also found that the electoral cycle over the growth rate of HDI is only present in election years, nothing was found before or after, and that this cycle has become stronger in the recent years. This might mean that, as countries prosperity increases over time, politicians are more aware of voters' social preferences and the increasing value they put on non-economic well-being.

Our results provide no evidence of left-wing governments being more prone to promote human development than other types of rulers. The political orientation of governments was consistently found to be innocuous for the growth path of human development. On the contrary, majority governments seem be associated with a decrease in the growth rate of human development.

A further detailed analysis accounting for some important characteristics of democracies showed that human development rises more significantly during election periods in less developed countries than in more advanced ones (the effect found for OECD countries is almost negligible). Moreover, the opportunistic development cycle seems to be a characteristic of countries where government mandates are longer and of proportional representation systems.

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Tables

Table 1. Political cycles in the growth rate of human development

	DifGMM1	DifGMM2	SysGMM1	SysGMM2	Static-FE	Dyn-FE	LSDVC
	(4)	(5)	(6)	(7)	(1)	(2)	(3)
L.HDI_gr	0.376***	0.329***	0.189	0.156		0.352**	0.403***
	(0.097)	(0.108)	(0.150)	(0.146)		(0.156)	(0.024)
Elect_yr	0.054**	0.037**	0.051**	0.035**	0.048**	0.053**	0.054**
	(0.025)	(0.019)	(0.021)	(0.017)	(0.020)	(0.023)	(0.027)
GovLeft	0.003	-0.001	-0.007	-0.002	-0.049	-0.032	-0.030
	(0.038)	(0.039)	(0.032)	(0.037)	(0.032)	(0.020)	(0.030)
GovMaj	-0.152*	-0.116	-0.136	-0.088	-0.210**	-0.155**	-0.145***
	(0.083)	(0.076)	(0.086)	(0.081)	(0.084)	(0.061)	(0.045)
GovCoal	-0.079	-0.064	-0.080	-0.050	-0.096	-0.066	-0.062
	(0.084)	(0.083)	(0.077)	(0.081)	(0.065)	(0.047)	(0.038)
MajCoal	0.091	0.055	0.094	0.046	0.163*	0.123**	0.114**
	(0.085)	(0.086)	(0.083)	(0.083)	(0.089)	(0.062)	(0.055)
EcoRating	0.030***	0.025***	0.031***	0.026***	0.019***	0.016***	0.015***
	(0.009)	(0.008)	(0.009)	(0.009)	(0.004)	(0.005)	(0.003)
FinRating	0.001	0.002	0.001	0.002	0.006*	0.003	0.003
	(0.004)	(0.004)	(0.004)	(0.004)	(0.003)	(0.003)	(0.003)
PolRating	-0.003	-0.001	-0.003	0.001	0.004	0.001	0.001
	(0.005)	(0.004)	(0.005)	(0.004)	(0.004)	(0.003)	(0.002)
Pop_gr	-0.044	-0.042	-0.044	-0.040	-0.016	-0.022**	-0.019
	(0.035)	(0.052)	(0.035)	(0.052)	(0.014)	(0.011)	(0.016)
Time	-0.012***	-0.013***	-0.013***	-0.014***	-0.015***	-0.011***	-0.010***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.002)	(0.002)	(0.001)
R^2					0.087	0.194	
# Observations	1616	1616	1717	1717	1719	1717	1717
# Countries	82	82	82	82	82	82	82
# Instruments	40	40	42	42			
Hansen *J*-test	0.147	0.147	0.032	0.032			
Diff. Hansen test			0.081	0.081			
AR(1)	0.007	0.017	0.000	0.042			
AR(2)	0.802	0.876	0.824	0.770			

Notes: See Tables A.1 and A.2 in Annex. Robust standard errors are in parentheses; significance levels at which the null hypothesis is rejected: ***, 1%; **, 5%, and *, 10%. One-step and two-steps differences and system GMM estimates are reported in columns (1)-(4); columns (5) and (6) report the results for static and dynamic fixed effects estimators, respectively. Bruno's (2005a, b) LSDVC estimates are shown in the last column. The lagged dependent regressor is treated as endogenous in the GMM estimations; their lagged values and the other explanatory variables are used as instruments in the first-difference equation; the lagged first-differences of the lagged dependent variable were also used in the levels equation in the system GMM estimations; they were collapsed to avoid the problem of having too many instruments. The Hansen *J*-test reports the *p*-value for the null hypothesis of instrument validity. The values reported for the Diff-in-Hansen test are the *p*-values for the validity of the additional moment restriction necessary for the system GMM. The values reported for AR(1) and AR(2) are the *p*-values for first and second order auto-correlated disturbances in the first differences equations.

Table 2. Elections timing, political orientation and support, and institutional issues

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
L.HDI_gr	0.313***	0.383***	0.427***	0.366***	0.371***	0.420***	0.382***	0.393***	0.303**
	(0.106)	(0.092)	(0.097)	(0.101)	(0.095)	(0.098)	(0.092)	(0.097)	(0.121)
Elect_yr	0.053***			0.039**	0.054**	0.042**	0.041**	0.048**	0.051**
	(0.016)			(0.020)	(0.024)	(0.021)	(0.021)	(0.024)	(0.023)
BefElect_yr	-0.010								
	(0.032)								
AftElect_yr		-0.018							
		(0.016)							
TimingElect			0.060**						
			(0.025)						
GovLeft	-0.010	-0.013	0.018		0.013	0.006	-0.004	-0.008	-0.026
	(0.037)	(0.038)	(0.029)		(0.036)	(0.032)	(0.033)	(0.037)	(0.037)
GovRight				0.020					
				(0.035)					
GovMaj	-0.177**	-0.151*	-0.130*	-0.157*		-0.215**	-0.247**	-0.147*	-0.170**
	(0.082)	(0.082)	(0.078)	(0.087)		(0.101)	(0.104)	(0.087)	(0.077)
GovCoal	-0.079	-0.072	0.019	-0.097		-0.052	-0.077	-0.095	-0.050
	(0.081)	(0.085)	(0.056)	(0.092)		(0.094)	(0.094)	(0.087)	(0.079)
MajCoal	0.112	0.083	0.050	0.107		0.119	0.153	0.090	0.122
	(0.081)	(0.084)	(0.077)	(0.087)		(0.097)	(0.095)	(0.090)	(0.084)
Maj%					-0.099				
					(0.157)				
EcoRating	0.030***	0.030***	0.027***	0.022***	0.030***	0.026***	0.024***		0.025***
	(0.009)	(0.009)	(0.009)	(0.005)	(0.009)	(0.006)	(0.006)		(0.005)
FinRating	0.001	0.001	0.001	0.003	0.001	-0.001	-0.001		0.004
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)		(0.004)
PolRating	-0.005	-0.002	-0.007	0.001	-0.003				0.002
	(0.005)	(0.005)	(0.006)	(0.003)	(0.005)				(0.004)
Democracy						0.051*	0.041		
						(0.027)	(0.026)		
Corruption						-0.047*	-0.039		
						(0.028)	(0.027)		
GovSize							0.024		
							(0.037)		
CompRating								0.017***	
								(0.004)	
Pop_gr	-0.033	-0.049	-0.049	-0.026	-0.049	-0.052	-0.071	-0.047	-0.058
	(0.034)	(0.037)	(0.039)	(0.028)	(0.034)	(0.079)	(0.084)	(0.035)	(0.038)
Time	-0.011***	-0.014***	-0.007**	-0.014***	-0.012***	-0.019***	-0.018***	-0.013***	-0.013***
	(0.003)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.005)	(0.004)	(0.003)
#Observations	1572	1584	1539	1503	1620	1134	1081	1616	1616
#Countries	81	82	82	81	82	56	55	82	82
#Instruments	41	40	40	40	38	41	41	38	121
Hansen *J*-test	0.168	0.140	0.138	0.140	0.141	0.221	0.147	0.163	0.894
AR(1)	0.003	0.007	0.011	0.000	0.007	0.000	0.000	0.008	0.001
AR(2)	0.935	0.825	0.749	0.765	0.831	0.650	0.568	0.729	0.907

Notes: See Table 1. Robust standard errors are in parentheses; significance levels at which the null hypothesis is rejected: ***, 1%; **, 5%, and *, 10%. The one-step difference-GMM estimator is employed in all estimations. The lagged dependent regressor is treated as endogenous (in regression 9 the economic, financial and political risk rating variables are also treated as endogenous); their lagged values and the other explanatory variables are used as instruments in the first-difference equation; they were collapsed to avoid the problem of having too many instruments. The Hansen *J*-test reports the *p*-value for the null hypothesis of instrument validity. The values reported for AR(1) and AR(2) are the *p*-values for first and second order auto-correlated disturbances in the first differences equations.

Table 3. Frequency of elections

	Average frequency of all countries				Average frequency of OECD countries			
	< 3.8 yrs	> 3.8 yrs	Elect3.8	Timing3.8	< 3.4 yrs	> 3.4 yrs	Elect3.4	Timing3.4
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
L.HDI_gr	0.308*	0.365***	0.377***	0.431***	0.578***	0.333***	0.377***	0.430***
	(0.187)	(0.124)	(0.096)	(0.097)	(0.081)	(0.115)	(0.096)	(0.097)
Elect_yr	0.049	0.070**			0.026	0.077**		
	(0.034)	(0.035)			(0.023)	(0.038)		
*Elect*MoreFreq*			0.045				0.025	
			(0.034)				(0.020)	
*Elect*LessFreq*			0.067**				0.075**	
			(0.034)				(0.038)	
Diff_ElectFreq			-0.022				-0.050	
			(0.048)				(0.041)	
*Timing*MoreFreq*				0.033				0.007
				(0.032)				(0.027)
*Timing*LessFreq*				0.097***				0.094***
				(0.032)				(0.032)
Diff_TimingFreq				-0.064				-0.087**
				(0.042)				(0.039)
GovLeft	0.030	-0.021	0.003	0.018	-0.016	0.020	0.004	0.018
	(0.032)	(0.072)	(0.038)	(0.029)	(0.036)	(0.054)	(0.038)	(0.029)
GovMaj	-0.144***	-0.153	-0.151*	-0.130*	-0.116	-0.165	-0.152*	-0.130*
	(0.050)	(0.175)	(0.082)	(0.078)	(0.072)	(0.134)	(0.083)	(0.078)
GovCoal	-0.021	-0.165	-0.077	0.021	0.022	-0.146	-0.079	0.021
	(0.059)	(0.164)	(0.083)	(0.056)	(0.072)	(0.140)	(0.083)	(0.056)
MajCoal	0.091	0.124	0.089	0.048	0.002	0.141	0.091	0.049
	(0.069)	(0.163)	(0.084)	(0.077)	(0.104)	(0.130)	(0.085)	(0.077)
EcoRating	0.032**	0.024***	0.030***	0.027***	0.025***	0.032***	0.030***	0.027***
	(0.013)	(0.007)	(0.009)	(0.009)	(0.008)	(0.012)	(0.009)	(0.009)
FinRating	-0.001	0.010	0.001	0.001	-0.003	0.004	0.001	0.001
	(0.005)	(0.006)	(0.004)	(0.004)	(0.004)	(0.005)	(0.004)	(0.004)
PolRating	-0.005	-0.004	-0.003	-0.007	-0.002	-0.005	-0.003	-0.007
	(0.008)	(0.005)	(0.005)	(0.006)	(0.005)	(0.007)	(0.005)	(0.006)
Pop_gr	-0.047	-0.001	-0.044	-0.050	-0.156	-0.021	-0.043	-0.050
	(0.053)	(0.019)	(0.035)	(0.039)	(0.114)	(0.029)	(0.035)	(0.040)
Time	-0.017***	-0.016**	-0.013***	-0.008**	-0.010***	-0.015***	-0.013***	-0.008**
	(0.005)	(0.008)	(0.004)	(0.004)	(0.002)	(0.006)	(0.004)	(0.004)
# Observations	749	867	1616	1539	410	1126	1616	1539
# Countries	32	50	82	82	21	61	82	82
# Instruments	40	40	41	41	40	40	41	41
Hansen *J*-test	0.272	0.420	0.148	0.138	0.883	0.391	0.154	0.139
AR(1)	0.074	0.000	0.007	0.011	0.000	0.019	0.007	0.011
AR(2)	0.632	0.794	0.808	0.764	0.896	0.839	0.822	0.739

Notes: See Tables 1 and 2, and Table A.2 in Annex. Robust standard errors are in parentheses; significance levels at which the null hypothesis is rejected: ***, 1%; **, 5%, and *, 10%. The one-step difference-GMM estimator is employed in all estimations. The lagged dependent regressor is treated as endogenous; their lagged values and the other explanatory variables are used as instruments in the first-difference equation; they were collapsed to avoid the problem of having too many instruments. The Hansen *J*-test reports the *p*-value for the null hypothesis of instrument validity. The values reported for AR(1) and AR(2) are the *p*-values for first and second order auto-correlated disturbances in the first differences equations. When the number of countries is low (when the sample is split), an LSDVC estimator was also used, but the results were similar; they are not reported here, but they are available upon request.

Table 4. Advanced economies, income and human development

	OECD vs Non-OECD countries			High vs Low Income countries			High vs Low HDI countries		
	OECD	NonOECD	Dummy	HIC	LIC	Dummy	HHDIC	LHDIC	Dummy
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
L.HDI_gr	0.398***	0.395***	0.378***	0.499***	0.322***	0.380***	0.515***	0.316***	0.381***
	(0.063)	(0.118)	(0.096)	(0.059)	(0.123)	(0.095)	(0.066)	(0.120)	(0.095)
Elect_yr	0.008	0.099**		0.008	0.116**		0.010	0.111**	
	(0.018)	(0.046)		(0.017)	(0.053)		(0.018)	(0.050)	
*Elect*OECD*			0.016						
			(0.018)						
*Elect*NonOECD*			0.094**						
			(0.045)						
Diff_OECD			-0.078*						
			(0.047)						
*Elect*HIC*						0.017			
						(0.015)			
*Elect*LIC*						0.116**			
						(0.056)			
Diff_IC						-0.099*			
						(0.056)			
*Elect*HHDIC*									0.015
									(0.016)
*Elect*LHDIC*									0.109**
									(0.052)
Diff_HDIC									-0.094*
									(0.053)
GovLeft	-0.017	0.031	-0.003	-0.034	0.068	0.001	-0.017	0.062	-0.001
	(0.042)	(0.060)	(0.038)	(0.042)	(0.057)	(0.038)	(0.045)	(0.055)	(0.038)
GovMaj	-0.087*	-0.234*	-0.148*	-0.133**	-0.235	-0.153*	-0.148***	-0.237	-0.153*
	(0.052)	(0.130)	(0.082)	(0.052)	(0.165)	(0.083)	(0.051)	(0.159)	(0.083)
GovCoal	0.032	-0.149	-0.079	0.019	-0.171	-0.080	0.006	-0.160	-0.079
	(0.053)	(0.127)	(0.083)	(0.046)	(0.168)	(0.083)	(0.048)	(0.162)	(0.083)
MajCoal	0.025	0.174	0.088	0.039	0.171	0.090	0.103*	0.165	0.091
	(0.057)	(0.139)	(0.085)	(0.064)	(0.174)	(0.085)	(0.057)	(0.168)	(0.086)
EcoRating	0.024***	0.035**	0.030***	0.020**	0.043***	0.030***	0.017*	0.041***	0.030***
	(0.008)	(0.014)	(0.009)	(0.008)	(0.017)	(0.009)	(0.009)	(0.014)	(0.009)
FinRating	0.004	0.003	0.001	0.002	0.006	0.001	0.005	0.002	0.001
	(0.004)	(0.007)	(0.004)	(0.004)	(0.008)	(0.004)	(0.004)	(0.007)	(0.004)
PolRating	0.002	-0.008	-0.003	0.006*	-0.015	-0.003	0.004	-0.012	-0.003
	(0.004)	(0.009)	(0.005)	(0.004)	(0.009)	(0.005)	(0.004)	(0.008)	(0.005)
Pop_gr	-0.041	-0.047	-0.041	-0.009	-0.341*	-0.046	-0.003	-0.345**	-0.045
	(0.077)	(0.042)	(0.035)	(0.024)	(0.191)	(0.036)	(0.023)	(0.143)	(0.036)
Time	-0.015***	-0.014*	-0.013***	-0.012***	-0.025***	-0.013***	-0.012***	-0.024***	-0.013***
	(0.003)	(0.008)	(0.004)	(0.003)	(0.010)	(0.004)	(0.003)	(0.008)	(0.004)
# Observations	837	779	1616	924	692	1616	892	720	1616
# Countries	34	48	82	41	41	82	37	45	82
# Instruments	40	40	41	40	40	41	40	40	41
Hansen *J*-test	0.418	0.206	0.146	0.239	0.405	0.146	0.212	0.306	0.155
AR(1)	0.000	0.024	0.007	0.000	0.033	0.007	0.000	0.030	0.007
AR(2)	0.681	0.880	0.797	0.973	0.961	0.817	0.681	0.844	0.809

Notes: See Tables 1-3 and respective notes; see also Table A.2 in Annex. High-income countries (HIC) are those are those that, according to the World Bank, have a GNI per capita of $12,736 or more; the other economies (LIC) are the group of countries with lower income (see http://data.worldbank.org/about/country-and-lending-groups, for details). For the high-HDI group (HHDIC) are considered those countries that, according to the United Nations Development Program, have an HDI higher than 0.800; the others (LHDIC) have a lower HDI (For further details, see http://hdr.undp.org/en/content/table-1-human-development-index-and-its-components).

Table 5. Presidential systems, plurality systems and proportional representation

	Presidential vs Non-Presidential			Plurarily vs Non-Plurality			Prop.Representation vs Non-PR		
	Presid	NonPresid	Dummy	Plural	NonPlural	Dummy	PR	NonPR	Dummy
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
L.HDI_gr	0.229*	0.472***	0.377***	0.342***	0.433**	0.376***	0.490***	0.183	0.375***
	(0.119)	(0.180)	(0.096)	(0.122)	(0.177)	(0.097)	(0.106)	(0.142)	(0.097)
Elect_yr	0.061*	0.045		0.059	0.041*		0.057**	0.043	
	(0.032)	(0.034)		(0.039)	(0.023)		(0.029)	(0.049)	
*Elect*Presid*			0.062*						
			(0.036)						
*Elect*NonPresid*			0.049						
			(0.033)						
Diff_Presid			0.014						
			(0.046)						
*Elect*Plural*						0.060			
						(0.040)			
*Elect*NonPlural*						0.049**			
						(0.023)			
Diff_Plural						0.011			
						(0.044)			
*Elect*PR*									0.055**
									(0.027)
*Elect*NonPR*									0.052
									(0.058)
Diff_PR									0.003
									(0.062)
GovLeft	0.001	0.042	0.002	-0.002	-0.022	0.003	0.015	0.001	0.002
	(0.074)	(0.040)	(0.039)	(0.040)	(0.069)	(0.039)	(0.047)	(0.083)	(0.038)
GovMaj	-0.220	-0.040	-0.151*	-0.130	-0.156**	-0.152*	-0.134**	-0.348	-0.151*
	(0.145)	(0.056)	(0.082)	(0.123)	(0.072)	(0.084)	(0.055)	(0.343)	(0.085)
GovCoal	-0.185	-0.001	-0.078	0.043	-0.148	-0.079	-0.027	-0.491	-0.078
	(0.150)	(0.057)	(0.084)	(0.115)	(0.125)	(0.084)	(0.080)	(0.468)	(0.084)
MajCoal	0.198	-0.001	0.090	-0.005	0.145	0.090	0.082	0.232	0.090
	(0.150)	(0.074)	(0.084)	(0.121)	(0.092)	(0.085)	(0.069)	(0.382)	(0.086)
EcoRating	0.025***	0.031**	0.030***	0.040***	0.017**	0.030***	0.030***	0.025**	0.030***
	(0.007)	(0.016)	(0.009)	(0.014)	(0.008)	(0.009)	(0.010)	(0.011)	(0.009)
FinRating	0.009	-0.006	0.001	-0.001	0.005	0.001	-0.002	0.011	0.001
	(0.007)	(0.005)	(0.004)	(0.006)	(0.005)	(0.004)	(0.004)	(0.011)	(0.004)
PolRating	-0.009*	-0.002	-0.003	-0.011	0.004	-0.003	-0.003	-0.012	-0.003
	(0.005)	(0.008)	(0.005)	(0.009)	(0.005)	(0.005)	(0.006)	(0.011)	(0.005)
Pop_gr	0.012	-0.100	-0.044	-0.046	-0.041	-0.043	-0.036	-0.099	-0.044
	(0.022)	(0.072)	(0.035)	(0.042)	(0.063)	(0.035)	(0.032)	(0.165)	(0.035)
Time	-0.012***	-0.012***	-0.012***	-0.006	-0.018***	-0.012***	-0.015***	0.006	-0.012***
	(0.004)	(0.004)	(0.004)	(0.006)	(0.004)	(0.004)	(0.004)	(0.011)	(0.004)
# Observations	771	844	1615	857	754	1611	1308	304	1612
# Countries	46	36	82	46	35	81	62	19	81
# Instruments	40	40	41	40	40	41	40	17	41
Hansen *J*-test	0.308	0.251	0.149	0.175	0.206	0.143	0.212	0.262	0.141
AR(1)	0.000	0.050	0.007	0.047	0.001	0.007	0.022	0.006	0.006
AR(2)	0.954	0.853	0.798	0.347	0.075	0.798	0.139	0.387	0.800

Notes: See Tables 1-4 and respective notes; see also Table A.2 in Annex. In regression (8) instruments for the dependent variable are collapsed and reduced to a maximum of 7 lags. The sample is split in subgroups of presidential and non-presidential, plurality and non-plurality systems, and countries with and without proportional representation regimes. In a presidential system the head of government is also head of state and leads an executive branch separated from the legislative branch. In plurality systems legislators are elected using a 'winner-take-all' rule. Proportional representation regimes elect candidates based on the percent of votes received by their party.

Table 6. Robustness checks

	DirIpol	CubIPol	SplIpol	Yr>1989	Yr>1999	Yr>2004	>04FE	>04FEc	DYr00	DYr05
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
L.HDI_gr_DirIpol	0.371***									
	(0.100)									
L.HDI_gr_CubIpol		0.437***								
		(0.110)								
L.HDI_gr_SplIpol			0.639***							
			(0.100)							
L.HDI_gr				0.336***	0.248**	0.108			0.379***	0.377***
				(0.100)	(0.103)	(0.100)			(0.096)	(0.096)
Elect_yr	0.054**	0.062**	0.050**	0.062**	0.090**	0.120**	0.130**			
	(0.024)	(0.027)	(0.025)	(0.028)	(0.044)	(0.058)	(0.064)			
*Elect*OECD*								0.032		
								(0.038)		
*Elect*NonOECD*								0.219**		
								(0.110)		
Diff_OECD								-0.187*		
								(0.111)		
*Elect*DYr>1999*									0.103**	
									(0.048)	
*Elect*DYr<2000*									0.005	
									(0.012)	
Diff_DYr00									0.099**	
									(0.049)	
*Elect*DYr>2004*										0.144**
										(0.073)
*Elect*DYr<2005*										0.013
										(0.013)
Diff_DYr05										0.131*
										(0.074)
GovLeft	0.001	-0.018	-0.017	0.005	0.046	0.069	0.124*	0.122*	-0.001	-0.004
	(0.038)	(0.042)	(0.044)	(0.041)	(0.066)	(0.071)	(0.066)	(0.065)	(0.038)	(0.038)
GovMaj	-0.160*	-0.163*	-0.173*	-0.162*	-0.210*	-0.273	-0.261**	-0.239**	-0.151*	-0.145*
	(0.082)	(0.096)	(0.095)	(0.093)	(0.117)	(0.190)	(0.114)	(0.117)	(0.083)	(0.083)
GovCoal	-0.082	-0.062	-0.128	-0.076	-0.130	-0.144	-0.143	-0.137	-0.084	-0.078
	(0.083)	(0.093)	(0.099)	(0.088)	(0.128)	(0.187)	(0.108)	(0.109)	(0.084)	(0.083)
MajCoal	0.099	0.087	0.124	0.103	0.127	0.163	0.264**	0.243*	0.087	0.087
	(0.084)	(0.101)	(0.102)	(0.095)	(0.127)	(0.182)	(0.120)	(0.125)	(0.086)	(0.085)
EcoRating	0.031***	0.031***	0.028***	0.033***	0.047***	0.052***	0.042***	0.041***	0.030***	0.031***
	(0.009)	(0.010)	(0.009)	(0.009)	(0.014)	(0.016)	(0.012)	(0.012)	(0.009)	(0.009)
FinRating	0.001	0.001	0.0010	-0.001	-0.002	-0.014	-0.007	-0.007	0.001	0.001
	(0.004)	(0.005)	(0.004)	(0.004)	(0.008)	(0.013)	(0.011)	(0.011)	(0.004)	(0.004)
PolRating	-0.003	-0.003	-0.004	-0.002	-0.001	0.011	0.009	0.010	-0.003	-0.003
	(0.005)	(0.006)	(0.006)	(0.006)	(0.011)	(0.019)	(0.015)	(0.015)	(0.005)	(0.005)
Pop_gr	-0.044	-0.032	-0.048	-0.049	-0.059	-0.039	0.029	0.031	-0.039	-0.045
	(0.035)	(0.035)	(0.032)	(0.037)	(0.047)	(0.058)	(0.032)	(0.032)	(0.034)	(0.035)
Time	-0.013***	-0.017***	-0.008*	-0.013***	-0.016**	-0.021	-0.026**	-0.026**	-0.013***	-0.014***
	(0.004)	(0.004)	(0.004)	(0.005)	(0.007)	(0.014)	(0.011)	(0.011)	(0.004)	(0.004)
R^2							0.114	0.120		
# Observations	1616	1457	1616	1414	854	526	535	535	1616	1616
# Countries	82	81	82	81	78	72	72	72	82	82
# Instruments	40	35	40	40	40	40			41	41
Hansen *J*-test	0.150	0.125	0.178	0.182	0.139	0.165			0.154	0.156
AR(1)	0.007	0.016	0.014	0.009	0.015	0.031			0.006	0.007
AR(2)	0.811	0.975	0.786	0.862	0.881	0.581			0.832	0.867

Notes: See Tables 1-5 and the respective notes. In regressions (1)-(3) the missing values for the dependent variable were obtained by direct interpolation of HDI, cubic interpolation and natural cubic spline interpolation, respectively. In regressions (4)-(8), the sample is restricted to the years after 1989, 1999 and 2004, respectively. The estimates in columns (7) and (8) were obtained using a fixed effects estimator. Dummies for the periods before and after years 2000 and 2005, respectively, are considered in regressions (9) and (10).

ANNEX

Table A1. List of Countries

Countries used in the estimations (82 countries):
Albania, Algeria, Argentina, Australia, Austria, Belgium, Bolivia, Botswana, Brazil, Bulgaria, Canada, Chile, Colombia, Costa Rica, Croatia, Cyprus, Czech Republic, Denmark, Dominican Republic, Ecuador, El Salvador, Estonia, Finland, France, Gambia, Germany, Ghana, Greece, Guatemala, Honduras, Hungary, Iceland, India, Ireland, Israel, Italy, Jamaica, Japan, Korea, Latvia, Luxembourg, Malawi, Mali, Malta, Mexico, Moldova, Mozambique, Netherlands, New Zealand, Nicaragua, Niger, Nigeria, Norway, Pakistan, Papua New Guinea, Paraguay, Peru, Philippines, Poland, Portugal, Romania, Russia, Senegal, Sierra Leone, Slovak Republic, Slovenia, South Africa, Spain, Sri Lanka, Sweden, Switzerland, Thailand, Trinidad and Tobago, Turkey, Uganda, Ukraine, United Kingdom, United States, Uruguay, Venezuela, and Zambia.

Countries with frequency of elections lower than 3.8 years (32 countries):
Albania, Argentina, Australia, Austria, Belgium, Canada, Chile, Croatia, Czech Republic, Denmark, Ecuador, El Salvador, Finland, Germany, Greece, Iceland, Israel, Italy, Japan, Latvia, Mexico, Netherlands, New Zealand, Pakistan, Philippines, Poland, Portugal, Slovak Republic, Slovenia, Spain, Sweden, and the United States.

Countries with frequency of elections lower than 3.4 years (21 countries):
Argentina, Australia, Austria, Belgium, Czech Republic, Denmark, Ecuador, El Salvador, Greece, Japan, Mexico, New Zealand, Pakistan, Philippines, Poland, Portugal, Slovak Republic, Slovenia, Spain, Sweden, and the United States.

OECD countries (34 countries):
Australia, Austria, Belgium, Canada, Chile, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Japan, Korea, Luxembourg, Mexico, Netherlands, New Zealand, Norway, Poland, Portugal, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Turkey, United Kingdom, and the United States.

High-income countries (41 countries):
Argentina, Australia, Austria, Belgium, Bulgaria, Canada, Chile, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Japan, Korea, Latvia, Luxembourg, Malta, Mexico, Netherlands, New Zealand, Norway, Poland, Portugal, Russia, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Turkey, United Kingdom, and the United States.

High-HDI countries (37 countries):
Argentina, Australia, Austria, Belgium, Canada, Chile, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Japan, Korea, Latvia, Luxembourg, Malta, Netherlands, New Zealand, Norway, Poland, Portugal, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, United Kingdom, and the United States.

Presidential systems (46 countries):
Algeria, Argentina, Bolivia, Brazil, Bulgaria, Chile, Colombia, Costa Rica, Croatia, Cyprus, Dominican Republic, Ecuador, El Salvador, Estonia, Finland, France, Gambia, Ghana, Guatemala, Honduras, Israel, Korea, Malawi, Mali, Mexico, Moldova, Mozambique, Nicaragua, Niger, Nigeria, Pakistan, Paraguay, Peru, Philippines, Poland, Russia, Senegal, Sierra Leone, South Africa, Sri Lanka, Switzerland, Ukraine, United States, Uruguay, Venezuela, and Zambia.

Plurality systems (46 countries):
Albania, Australia, Bolivia, Botswana, Brazil, Canada, Chile, Croatia, Czech Republic, Dominican Republic, Ecuador, El Salvador, France, Gambia, Germany, Ghana, Greece, Guatemala, Honduras, Hungary, India, Italy, Jamaica, Japan, Korea, Latvia, Malawi, Mali, Mexico, New Zealand, Niger, Nigeria, Pakistan, Papua New Guinea, Philippines, Poland, Senegal, Sierra Leone, Spain, Switzerland, Thailand, Trinidad and Tobago, Ukraine, United Kingdom, United States, and Zambia.

Proportional representation regimes (62 countries):
Albania, Algeria, Argentina, Australia, Austria, Belgium, Bolivia, Brazil, Bulgaria, Colombia, Costa Rica, Croatia, Cyprus, Czech Republic, Denmark, Dominican Republic, Ecuador, El Salvador, Estonia, Finland, Germany, Greece, Guatemala, Honduras, Hungary, Iceland, India, Ireland, Israel, Italy, Japan, Korea, Latvia, Luxembourg, Malta, Mexico, Moldova, Mozambique, Netherlands, New Zealand, Nicaragua, Niger, Norway, Paraguay, Peru, Philippines, Poland, Portugal, Romania, Russia, Senegal, Slovak Republic, Slovenia, South Africa, Spain, Sri Lanka, Sweden, Switzerland, Turkey, Ukraine, Uruguay, and Venezuela.

Table A2. Computation of the Human Development Index

The Human Development Index combines following three dimensions:

1. A long and healthy life:
   Life Expectancy Index (*LEI*) = (Life Expectancy at Birth-20)/(85-20)
2. Being knowledgeable:
   Education Index (*EI*) = (MYSI+EYSI)/2
   2.1. Mean Years of Schooling Index (MYSI) = Mean Years of Schooling/15
   2.2. Expected Years of Schooling Index (MYSI) = Expected Years of Schooling/18
3. A decent standard of living:
   Income Index (*II*) = [ln(GNIpc)-ln(100)]/[ln(75000)-ln(100)]
   Note: GNIpc is the gross national income per capita (in US dollars, PPP)

$$\boldsymbol{HDI = (LEI*EI*II)^{1/3}}$$

Source: Technical Notes, Human Development Report, United Nations Development Program 2014 (http://hdr.undp.org/en/data).

Table A3. Descriptive Statistics

	Obs.	Mean	Std.Dev.	Min.	Max.
HDI	4160	0.635	0.172	0.192	0.950
HDI_gr	4025	0.799	0.887	-7.646	13.512
Elect_yr	2380	0.257	0.437	0	1
TimingElect	2242	0.642	0.281	0.091	1
GovLeft	1924	0.354	0.478	0	1
GovRight	1881	0.504	0.501	0	1
GovMaj	2337	0.743	0.437	0	1
GovCoal	2372	0.566	0.496	0	1
MajCoal	2331	0.426	0.495	0	1
Maj%	2354	57.711	15.101	9.278	100
EcoRating	3778	33.780	7.180	0	50
FinRating	3778	34.698	8.675	4	50
PolRating	3778	64.303	15.146	9	97
CompRating	3778	66.435	13.737	14	96
Corruption	3795	3.004	1.354	0	6
Democracy	2824	3.473	6.910	-10	10
GovSize	2407	5.708	1.548	1.237	9.934
Pop_gr	5241	1.665	1.529	-6.343	17.625
Time	5447	28.081	9.978	1	34

Notes: Data for 182 countries over the period 1980-2013; Due to missing values for some variables, the number of countries used in the estimations is reduced to 82.
Sources: The data for HDI comes from the Human Development Report, United Nations Development Program 2014 (http://hdr.undp.org/en/data). The political variables were obtained from the Database of Political Institutions 2012, World Bank (http://www.worldbank.org) and Comparative Political Data Set I 2013 (http://www.cpds-data.org/). The *$Rating* and *Corruption* variables come from the International Country Risk Guide (http://www.prsgroup.com). *Democracy* is the *'polity2'* variable in the Polity IV Database. The *GovSize* is the *'fi_sog'* index in the Economic Freedom of the World, Fraser Institute, (http://www.freetheworld.com/). The data for *Pop_gr* comes from the World Development Indicators, World Bank (http://data.worldbank.org/).

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