**Democratic Governance and Sustainable Human Development**

**Final Report**

**The Institute for Democracy and Conflict Resolution**



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Final Report prepared for the UNDP Oslo Governance Centre

May 2012

# Executive summary

1. The understanding of the relationship between **Democratic Governance (DG)** and **Sustainable Human Development (SHD)** has evolved out of UN policy since the establishment of the Bretton Woods institutions.
2. The idea of governance now includes *good* governance and *democratic* governance, which is a more holistic concept comprising **inclusive participation** and **responsive state capacity**.
3. Cross-national quantitative research shows increasing evidence for **positive effects of democracy on particular aspects of development**, including human development, inclusive growth, human capital formation, caloric intake, and the provision of public goods.
4. There are **five main hypotheses** linking sustainable **DG** and **SHD**:

*H1: Leaders who obtain office through open competition and participation are more likely to produce SHD relative to leaders whose tenure does not depend on open competition and participation.*

*H2: Leaders whose tenure does not depend on open competition and participation but do not rely on free resources are more likely to produce SHD relative to leaders in a similar political context who rely on free resources.*

* 1. *H3: Political systems with more constraints on the executive are better for overseeing policies that are good for SHD.*
  2. *H4: political systems with a greater protection of rights to free speech, assembly, and association are better for SHD.*
  3. *H5: countries with a more fully developed democratic culture and deep commitment to democratic values are better for SHD.*

1. **Operational measures** of **DG** and **SHD** used in this report draw on existing measures of democracy, human rights, and development about which there is a good degree of consensus and that have good temporal and spatial coverage.
2. The statistical analysis presented here reveals the following findings for the relationship between **DG** and **SHD**:
   1. There are significant and positive relationships for different dimensions of **DG** and human-related indicators of **SHD** (human development index and caloric intake) across bivariate and multivariate analyses.
   2. While economic growth has deleterious effects across the environment-related indicators of **SHD**, wealthy countries with higher levels of **DG** do slightly better than other types of countries (i.e. rich countries with very low **DG**, or poor countries with high **DG**).
   3. **DG** is thus good for human–related dimensions of SHD and is least bad for environmental dimensions of **SHD** among wealthy countries with high levels of **DG**.
3. The **DG** dimensions for UNDP programming are:
   1. Enhancing competitiveness of executive recruitment
   2. Fortifying constraints on executive authority
   3. Organization and regulation of broad-based political participation
   4. Protection of human rights
4. Areas for further analysis include:
   1. The inter-connections between processes of human development and impact on the environment
   2. Patterns of consumption in all countries, but in particular wealthy countries
   3. How **DG** interacts with material-based and consumption-based conceptions of development and future protection of the environment

Contents

[Background and Introduction 1](#_Toc324430247)

[Democracy and Development 3](#_Toc324430248)

[Democratic Governance 5](#_Toc324430249)

[Sustainable Human Development 8](#_Toc324430250)

[Theoretical Connections 10](#_Toc324430251)

[Empirical Analysis 13](#_Toc324430252)

[Bivariate Analysis 14](#_Toc324430253)

[DG and Human-Related Dimensions of SHD 14](#_Toc324430254)

[Environment-Related Dimensions of SHD 18](#_Toc324430255)

[Multivariate Analysis 19](#_Toc324430256)

[Modeling DG and Human-related dimensions of SHD 21](#_Toc324430257)

[Modeling DG and Environment-related dimensions of SHD 21](#_Toc324430258)

[Summary and Implications 22](#_Toc324430259)

[References 25](#_Toc324430260)

[A Note on the Authors 30](#_Toc324430261)

[Technical Annex 32](#_Toc324430262)

[Table A1. Descriptive statistics of the variables used in the analysis 32](#_Toc324430263)

[Table A2. Regression estimates for Democratic Governance and Human Development 33](#_Toc324430264)

[Table A3. Regression estimates for Democratic Governance and Caloric Intake 34](#_Toc324430265)

[Table A4. Regression estimates for Democratic Governance and Forest Area 35](#_Toc324430266)

[Table A5. Regression estimates for Democratic Governance and Water Pollution 37](#_Toc324430267)

[Table A6. Regression estimates for Democratic Governance and Fossil Fuel Consumption 39](#_Toc324430268)

[Table A6. Regression estimates for Democratic Governance and Fossil Fuel Consumption 41](#_Toc324430269)

[Table A6. Regression estimates for Democratic Governance and CO2 Emissions 43](#_Toc324430270)

[Table A6. Regression estimates for Democratic Governance and Ecological Footprint 45](#_Toc324430271)

# Background and Introduction

In the context of the global economic and other crises, development discourses are being reshaped as international and national financial, economic and political contexts continue to change. The concept of development itself has moved well beyond its original and simpler conception based on growth in per capita income levels to broader concepts of *human development*. In addition, as the Rio+20 Conference approaches, **sustainable human development (SHD)**, with its **three pillars** of (1) the social, (2) the economic and (3) the environmental, is returning to centre stage as an organizing concept for development.

Since the late 1980s and early 1990s, the idea of governance has also evolved beyond its more technocratic understanding of sound public finance to the ideas of **good governance**, developed by the World Bank, and **democratic governance (DG)**, developed by the UNDP. **DG** has an emphasis on democratic *processes* and *institutions*, as well as *principles* such as *inclusion*, *participation*, *non-discrimination*, *accountability* and *transparency*. Even since its early formulation in the 1990 Human Development Report, the idea of democratic governance has expanded to include a role for *civil society* alongside more classic understandings of governance that focus on state institutions (see UNDP 2010).

International discussions of the **means** through which sustainable human development is to be achieved have included a significant role for democratic governance. The assumption is that more inclusive, participatory, and accountable governance is important for achieving sustainable human development. In short, democratic governance is good for sustainable human development:

**DG**

**SHD**

**+**

Additionally, while the number of countries usually classified as ‘democratic’ has increased since the 1970s, so too has global inequality *between* rich and poor countries as well as *within* many countries. Moreover, although the argument that democratic governance is good for sustainable human development is intuitively attractive and widely acknowledged, its empirical foundations are little explored and the assumptions for the causal connections between **DG** and **SHD** are currently weak.

Some existing statistical analysis has suggested that democracies are better at providing human development (a combined measure of income, literacy and longevity), are better at distributing the benefits of development, measured through income distribution indicators or total caloric intake (e.g. Ersson and Lane 1996; Halperin, Siegle and Weinstein 2010; Blaydes and Kayser 2011), and are better at promoting human capital formation through direct public expenditure on health and education, which in turn has a positive impact on growth (Baum and Lake 2003).[[1]](#footnote-1) For the direct relationship between democracy and growth, however, analyses show that democracies are no better than non-democracies, but they also show that democracies *are no worse* (Przeworksi, Alvarez, Cheibub and Limongi 2000).

Related analyses show that democracies lower the probability of inter-state conflict (e.g. Russett and Oneal 2001), that democracies tend to use less repression in the face of domestic conflict (e.g. Davenport 2007), and that they are better at protecting human rights (Poe and Tate 1994; Landman 2005a, 2005b). There is also a positive and significant relationship between income distribution and the protection of civil and political rights, even after controlling for democracy, conflict, ethnic fractionalization, population size and regional location (Landman and Larizza 2009).

***These analyses, however, have not focused precisely on operational measures of democratic governance (DG) or sustainable human development (SHD).***

UNDP is a key development organization and as the UN system’s main advocate of democratic governance needs to explore the relevance and importance of **DG** in **SHD** further, and how support to each of the pillars and their interaction can contribute to the achievement of **SHD**.

Work in this area should, in the short term, contribute to the discussions at and after the 2012 UN Conference on Sustainable Development (Rio +20), as well as to the discussions surrounding the post-2015 development framework in the longer term.

This report explores the links between **DG** and **SHD** conceptually and empirically, as follows:

1. Summarizes the main literature on democracy and development to show the empirical precedents for a relationship between **DG** and **SHD**;
2. Provides operational definitions for **DG** and **SHD**;
3. Specifies a number of causal arguments on the connection between **DG** and **SHD**;
4. Provides a list of quantitative indicators for **DG** and **SHD**, as well as the necessary control variables that will be used in the statistical modeling of the relationship.
5. Models the relationship between different dimensions of DG and SHD using bivariate and multivariate analysis;
6. Provides guidance on the necessary areas for strengthening **DG** and pursuing **SHD**.

# Democracy and Development

In order to understand the precedents for the empirical relationship between **DG** and **SHD**, it is important to understand the key dimensions of research on the relationship between democracy and development. In particular, these precedents help inform the definitions, operational measures, and research design issues for this present study on **DG** and **SHD**.

There is a long history in the analysis of the relationship between democracy and development that dates back to the seminal work of Seymour Martin Lipset (1959, 1960). The emphasis of much of this work has been on the causal relationship that flows from development to democracy rather than the other way around. From Lipset’s original cross-national statistical analysis to the latest pooled-cross section time-series analyses evidence has shown that there is a positive and significant relationship between development and democracy (see, e.g. Rueschemeyer, Stephens and Stephens 1992; Przeworski, Alvarez, Cheibub and Limongi 2000; Landman 2008).

The exact specification of the relationship remains a matter of continued debate. Those that subscribe to the idea of *endogenous democratization* (Boix 2003; Boix and Stokes 2003), argue that economic development *causes* democracy, while those that subscribe to the idea of *exogenous democratization* argue that a higher level of economic development merely *enhances the probability that a new democracy will survive* (Przeworski, Alvarez, Cheibub and Limongi 2000). In either case, development is seen as a key driver for sustainable democracy.

For the reverse relationship from democracy to development, the end of the Cold War and successive ‘waves’ of democracy were accompanied by a rising expectation about the tangible benefits of democratic rule for development. Citizens in ‘new’ democracies (i.e. post-1974) and policy makers in old democracies expected that the stability and voice made possible under democratic rule would provide a better system for long term economic development. The experience of post-war economic expansion within the democracies of Europe and North America certainly added weight to this argument as did an overall attraction of the ‘modernization’ perspective within particular academic and policy circles (see, e.g. Cammack 1997; Landman 1999; Singer 1997; Inglehart and Welzel 2005; Fukuyama 1992; 2006).

Despite this optimism around democracy, there was little initial empirical support for the argument that democracy is a better political system for promoting development. But the analysis of this relationship hinges very much on how both the concepts are defined and measured. Definitions for democracy have ranged from so-called ‘thin’ procedural definitions that draw on work of Robert Dahl (1971) in his seminal book *Polyarchy* to ‘thick’ definitions that include not only democratic procedures and institutions, but the full range of human rights protection (Collier and Levitsky 1997; Donnelly 1999; Foweraker and Krznaric 2001).

There are literally thousands of different measures for democracy that have ranged from binary coding of countries according to thresholds of democratic criteria (e.g. Lipset 1959; Przeworski, Alvarez, Cheibub and Limongi 2000) to ‘scales’ of democracy and democratic performance that reward countries for the presence of institutions and rights protections (e.g. Barsh 1993; Foweraker and Krznaric 2001; Landman and Häusermann 2003). These measures are then used in simple bivariate and more complex multivariate statistical models to assess the relative importance of democracy for development alongside other control variables.

As we shall see below, definitions for development have ranged from a focus on progressive growth in national income per annum to more holistic conceptions that include freedom from servitude, the realisation of self-esteem and the progressive improvement in individual capabilities and overall ‘agency’ within society (e.g. Sen 1999; Ignatieff 2001; Todaro and Smith 2011). Following these different definitions, measures for development have ranged across such indicators as income per capita (or annual levels of per capita GDP); income and land inequality; combined measures of income, life expectancy, and literacy (UNDP 1990); the prevalence of ‘night lights’ (Henderson, Storeygard, and Weil 2009) and caloric intake of the population (Blaydes and Kayser 2011).

Across these different definitions and measures of both democracy and development, there are a number of emerging empirical findings in the literature that lend support to the argument that democracy may well be good for development. Some studies find little or insignificant net effects of democracy on growth (e.g. Helliwell 1994; Przeworski, Alvarez, Chiebub and Limongi 2000). Other studies find a net positive *direct* effect of democracy on inclusive growth (see Sen 2012), while yet other studies find net positive *indirect* effects of democracy on growth, either as a function of political stability (e.g. Feng 1997) or the promotion of human capital formation (Baum and Lake 2003).

The most supportive findings for the benefits of democracy on development, however, involve measures of development that move beyond mere growth in levels of per capita GDP. For example, using both the UNDP’s human development index and the Physical Quality of Life Index (PQLI) as measures of development and several different measures of democracy, Ersson and Lane (1996: 64-65) find a robust positive relationship between democracy and development.

Across a wider range of development indicators, but with a somewhat simpler method of analysis, Halperin, Siegle and Weinstein (2010), have a number of positive findings for democracy. For all countries in the world between 1960 and 2001, democracies have had higher levels of economic growth on average than non-democracies. For low income countries, democracies do not outperform non-democracies on growth (confirming Przeworski et al. 2000), but they do outperform non-democracies in terms of life expectancy, secondary school enrolment, agricultural production, infant mortality, and human development.

These findings for alternative measures of development are also upheld in analyses that use satellite image data on the prevalence of ‘night lights’ (Min 2010) and total and animal caloric intake by the population (Blaydes and Kayser 2011). Min (2010) sees the night lights data as a measure of public good provision, while Henderson et al. (2009) see the data as a measure of income; however, the key finding is the positive and significant relationship between democracy and night lights. Blaydes and Kayser (2011) see total and animal caloric intake as alternative measures for transfers to the poor (i.e. redistribution) and find that for lesser developed countries (less than 10,000 constant 2000 USD per capita GDP) between 1961-2003, democracies outperform non-democracies and so called ‘hybrid’ regimes that share autocratic and democratic features.

The literature on democracy and development thus suggests that there are tangible benefits for countries that are more democratically governed than for countries that are not. The findings are not particularly robust for the traditional measure of economic growth, but it appears that for those measures of development that capture broader understandings of human well-being, there does appear to be a ‘democracy advantage’ (Halperin, Siegle and Weinstein 2010).

Across many of these studies, it is important to point out that measures of democracy have been scales that range from low levels of democracy to high levels of democracy. This understanding of democracy as being on a continuum is useful for present purposes in this study, since **DG** and its different dimensions can be more or less present in a country. While some studies on democracy (e.g. Przeworski, Alvarez, Cheibub and Limongi 2000) see it as an ‘all or nothing affair’ and use so-called ‘dichotomous’ measures for democracy (i.e. 0 = autocracy and 1 = democracy), the present study is concerned with *degrees* of **DG** and *variations in the different dimensions* of **DG**, which can have an impact on *different dimensions* of **SHD**.

The analysis in this project, however, differs from this existing research in two further ways. First, this study is concerned with *democratic governance*, which is a concept that shares many features with democracy but that also has some of its own unique features. Second, it is concerned with *sustainable human development*, which requires an understanding of development that is sensitive to the adverse impact of consumption from one year to the next, as well as one generation to the next. The next section of this report thus outlines definitions and operational measures for **DG** and **SHD**.

# Democratic Governance

The notion of governance has a long etymology and evolution, while the ideas of *good* governance and *democratic* governance have increasingly become better known and important within academic and policy circles (UNDP 1999; Weiss 2000). These ideas have developed from a neutral and generic reference to the overall set of relations within the public sphere to one that includes an expanding set of normative dimensions. Leading definitions of governance include:

* Court (2002: 5), in drawing on a collaborative project that measures good governance, defines governance as the ‘formation and stewardship of the formal and informal rules that regulate the public realm, the arena in which state as well as economic and societal actors interact to make decisions.’
* Kaufmann et al. (1999a: 1) define governance broadly ‘as the traditions and institutions by which authority in a country is exercised. This includes (1) the process by which governments are selected, monitored and replaced, (2) the capacity of the government to effectively formulate and implement sound policies, and (3) the respect of citizens and the state for the institutions that govern economic and social interactions among them’.
* In its 1995 Guidelines the OECD uses the term ‘governance’ in accordance with a World Bank definition to denote ‘the use of political authority and exercise of control in society in relation to the management of its resources for social and economic development’ (OECD, 1995).
* The Commission on Global Governance (1995: 2) defines it as ‘the sum of the many ways individuals and institutions, public and private, manage their common affairs. It is the continuing process through which conflicting or diverse interests may be accommodated and co-operative action may be taken’ (quoted in Weiss 2000: 795-796).
* The UNDP (2010: 14) defines governance as ‘comprising the mechanisms, processes and institutions that determine how power is exercised, how decisions are made on issues of public concern, and how citizens articulate their interests, exercise their legal rights, meet their obligations and mediate their differences.’

It is clear that these definitions share certain features such as formal and informal rules, the public realm shared by government and civil society, the making and breaking of governments, and the management of different sets of competing interests. While the World Bank made popular the idea of *good* governance, the UNDP, through focusing on **democratic governance** has developed the concept to incorporate a political dimension that includes government legitimacy, government accountability, government competence, and the protection of human rights through the rule of law.

The concept is more expansive and ‘people centered’ to include important principles and processes. The adjective ‘democratic’ comes from the ‘most fundamental principle of democracy—that people should govern themselves through the systems they choose through open and transparent participatory processes’ (UNDP 2008). Moreover,

*[d]emocratic governance means that people have a say in the decisions that affect their lives and that they can hold decision-makers accountable. It further entails that the rules, institutions and practices that govern social interactions are inclusive and fair, that women are equal partners with men in private and public spheres of life, that people are free from discrimination based on race, ethnicity, class, gender or any other attribute, and that the needs of future generations are reflected in current policies. It also means that economic and social policies are responsive to people’s needs and their aspirations, that these policies aim at eradicating poverty and expanding the choices that all people have in their lives, and that human rights and fundamental freedoms are respected* (UNDP 2008)*.*

This concept of **democratic governance** draws very much on earlier conceptions of governance and is now seen as comprising the following two key dimensions (UNDP 2010: 17-18):

* **fostering inclusive participation**, which is achieved through **effective channels** for citizens to express their interests (elections, participation in the public sphere, political parties, civil society, voluntary organizations, and increasingly social media) and the means to hold government **accountable**.
* **strengthening responsive state capacity**, which is achieved through strengthening public administration reform, local governance institutions, parliament, access to justice and the rule of law.

The measurement of governance (and its variants) has a shorter history than the measurement of democracy, but since the 1980s academics, IGOs, and NGOs (as well as private sector companies) have been developing different indicators for good governance. Landman and Häusermann (2003: 28) identify five different types of measures, which include:

1. civil and political liberties or political freedoms as proxy measures for the rule of law
2. the frequency of political violence as an inverse measure of good governance
3. expert assessments and opinion of good governance for investment
4. objective indicators such as ‘contract intensive money’ (CIM) as a measure of individual confidence in the domestic financial institutions (Clague et al. 1995, 1999; Knack 2002) or the economic rate of return (ERR) of governmental projects (Isham et al. 1997)
5. mixed measures that combine aggregate data, scales, and expert opinion (e.g. Kaufmann et al. 1999, 2002, 2003).

Each of these measures has a number of strengths and weaknesses relating to their degree of subjectivity, the focus on economic versus political content, selection bias, measurement error, spatial and temporal coverage, and face validity (i.e. measuring what they purport to measure).

As we have seen, however, the UNDP’s conception of **democratic governance** differs from the definitions of governance used to derive the different types of measures listed above. The combination of **inclusive participation** and **responsive state capacity** needs to be operationalised in ways that capture these two dimensions.

Given the emphasis on **democracy** in the definition, we propose to use several measures that are already widely available and popular in academic research and policy analysis.

First, the **Polity IV combined measure of democracy-autocracy** takes into account democratic and autocratic features of regimes and is available for a wide number of countries over long periods of time. The Polity data have been used across a large number of academic studies in international relations and comparative politics. The democracy-autocracy scale ranges from -10 (autocracy) to +10 (democracy) and is consistent with an understanding of a continuum rather than a dichotomy of regime types (see UNDP 2007).

Second, the **Polity IV** combined measure of democracy-autocracy is comprised of five main components, which include (1) **constraints on the chief executive**, (2) **competitiveness of executive recruitment**, (3) **openness of executive recruitment**, (4) **competitiveness of political participation**, and (5) **regulation of political participation**. The analysis includes and benefits from using both the aggregate democracy-autocracy measure to test the overall relationship between **DG** and **SHD**, as well as the individual components to see which aspects of **DG** matter most for **SHD**. Indeed, previous academic research has shown the benefits of using precisely these different components of the Polity data (see, e.g. Bueno de Mesquita, Downs, Smith and Cherif 2005; Vreeland 2008), where those that focus on executive power have had the greatest significance across the studies.

Third, as human rights and the rule of law feature widely in definitions of good governance and reflect both the idea of *inclusion* and *responsiveness* found in **DG**, this study will use the **Cingranelli and Richards (CIRI) ‘physical integrity rights’ index**, which is a combined measure of the rights ‘not to be tortured, extrajudicially killed, disappeared, or imprisoned for political beliefs’ (see Cingranelli and Richards 2010: 397). The combined index ranges from 0 (systematic violations of these human rights) to 8 (no violations of these human rights) and results from coding US State Department human rights country reports. The CIRI data have featured widely throughout academic and policy research and the scale itself benefits from multiple coding teams and inter-coder reliability tests, and the index correlates well with the two versions of the ‘political terror scale’ (see [www.humanrightsdata.com](http://www.humanrightsdata.com), UNDP 2007; Landman and Carvalho 2009; Landman and Larizza 2009).

Taken together, these different measures are available for a wide range of countries and time, range from low (poor performance) to high (good performance), are well-known and widely used, and can be used separately or combined through factor analysis data reduction techniques since they are highly correlated with one another (see Landman and Larizza 2009).

# Sustainable Human Development

As outlined above, the concept of development has evolved since the establishment of the Bretton Woods institutions. It was originally conceived as the progressive growth in national income per year and was typically expressed as the percentage change in GDP or per capita GDP. Underlying the definition was an assumption of a process of structural change in the economy away from a dependence on agricultural production to one that was mixed between agriculture, industry and services.

Subsequent definitions, particularly in light of the experiences in lesser developed countries, focused more on questions of poverty and the equitable distribution of the fruits of development. But the focus on GDP or distribution are still aggregate national level concepts of development and do not focus on individual well-being.

Human-centred definitions of development emerged in the 1990s and focused on values and capabilities. For example Michael Todaro (1997:16-18) specified three core values of development: (1) *sustenance* (or the ability to meet basic needs), (2) *self-esteem* (the ability to ‘be a person’) and (3) *freedom from servitude* (the ability to choose). The shift to people is also reflected in the UNDP’s (1990, 2010) definition of **human development**: ‘expanding capabilities and enlarging the choices people have to live fulfilling lives (UNDP 2010: 5)’.

In both cases, the definitions are concerned with the conditions under which individuals can flourish, meet their needs, make choices about their lives, and make progress in their own development free from structural or other constraints. Such a conception of development sits well with larger understandings of freedom and agency that appeared in Amartya Sen’s (1999) *Development as Freedom* and Michael Ignatieff’s (2001) *Human Rights as Politics and Idolatry*.

The expanded and human-centred definitions of development, however, neglected the crucial aspect of **sustainability**. The 1987 Bruntland Report of the World Commission on Environment and Development defines sustainable development as

*...a process of change in which the exploitation of resources, the direction of investments, the orientation of technological development; and institutional change are all in harmony and enhance both current and future potential to meet human needs and aspirations.[[2]](#footnote-2)*

The combination of human development with sustainability involves two **time-dependent** and **potentially contradictory** processes. One – human development – is the progressive advance and expansion in capability and the other – sustainability – is mindful that such expansion does not have an adverse impact on future generations. In terms of measurement we propose using several different indicators:

**UNDP Human development index** – a combined measure of per capita GDP, levels of educational attainment and life expectancy. The HDI has been widely used throughout academic and policy circles and has become a measure of the broader conception of development outlined here.

**Sustainability indicators** - In addition to the HDI, the analysis in this study uses direct indices or modified version of indices on environmental sustainability found in the UNDP’s 2011 Human Development Report (see Table 6, page 146), as well as the Caloric intake measures found in Balydes and Kayser (2011).

**Forest area** – total area of forest per year (% of land mass)

**Organic water pollution** **emissions** (kg per day per worker)

**Fossil fuel energy consumption** (% per year)

**CO2 emissions** – metric tons per capita

**Ecological footprint –** consumption, production and bio capacity

**Caloric intake** – total and animal caloric intake per year

Each of the indicators measures different aspects of sustainable human development. Some are more human-centred and some are more consumption-related, but together they give a good sense of changes in sustainable human development over time, and are used alongside the measures for **DG** to test for the different relationships between **DG** and **SHD**.

# Theoretical Connections

Across a number of publications, the UNDP has argued in consistent fashion that **DG** is good for human development and now sustainable human development. Despite the emerging findings that there is a positive relationship between democracy and some aspects of development outlined above, the relationship itself remains theoretically underspecified. Advocates of the ‘democracy advantage’ (Halperin, Siegle, and Weinstein 2010) present a basket of features about democracy that ought to account for superior developmental performance, but do not unpack some of the underlying assumptions about incentives and constraints within democratic systems that significantly condition any relationship between democracy and development.

***These incentives and constraints are equally present in the concept of DG and the reasons why it may be good for SHD.***

This section of the report examines a series of theoretical arguments that link particular aspects of **DG** to **SHD**.

In a seminal piece from 1981, Meltzer and Richard argue that the size of government (i.e. the share of national income that is redistributed) is a function of majority rule, where ‘[a]n increase in mean income relative to the income of the decisive voter increases the size of government’. This basic economic insight of an equilibrium point between majority rule and redistribution has informed subsequent thinking on the relationship between democracy and development.

This thinking has focused on both the relative presence and constraining effect of institutions and the structure of incentives for governing elites to engage in the kind of redistributive policies that contribute to development. A large proportion of the current political economy literature on economic growth and development places an emphasis on institutions (e.g. North 1981; Rodrik 1999; Acemoglu and Robinson 2001a, 2001b, 2006; Humphreys and Weinstein 2009).

However, more recent theories of growth focus on the incentives that these institutions provide to leaders who maximize their tenure in office (Bueno de Mesquita et al. 2003; Bueno de Mesquita and Smith 2009a, 2009b, 2010). In order to stay in office, leaders must keep the loyalty of a minimum number of supporters. The policies that best attain this goal depend on two crucial components of a political system, the *selectorate* (S) and the *winning coalition* (W). Leaders provide a mix of public and private goods to their coalition members. However, in large coalition systems, leaders provide a larger proportion of public goods (e.g. economic growth, national security), while in small coalition systems, they provide private goods to their supporters in order to stay in office.

Policies related to sustainable human development are no exception and hence their implementation is also subject to political incentives. Sustainable human development policies will be implemented if and only if they improve a leader’s prospects for staying in office. These policies are most likely to be implemented in political systems with large winning coalitions, such as democracies, as this is the most efficient way of keeping the political support of a key coalition and staying in office. They are less likely to be implemented in political systems with small winning coalitions such as autocracies. Sustainable human development policies are less likely to be implemented in autocracies because they involve the future, and the future is a public good.

If leaders in small coalition systems do not have incentives to provide policies that foster human development at the present time, they have fewer incentives to implement policies that secure development in the future. The three pillars of SHD (like those that comprise the human development index) have strong public goods components, particularly the environmental pillar and its connection to sustainability. The problem with sustainability, and consequently with the long run, is that it is a pure public good; at time *“t”* nobody can be excluded from consuming it, and the consumption of the future by one individual does not exclude the consumption of another individual. If small coalition systems do not invest in health, education, and improved living standards because they do not facilitate political survival, it is highly unlikely that such systems will invest in future health, education, and living standards.

Somewhat more technically, leaders will maximize the utility of their supporters at every time “*t*” and leave no resources (environmental or any other type) for the next generation. In the context of a simple bequest game where the utility of one generation depends on its consumption of a good at time *t* and the consumption of the next generation at time *t+1*, the Markov perfect equilibrium consists of a constant savings ratio that is a function of the discount factor and the productivity of the savings (Fudenberg and Tirole 1991). Leaders have a discount factor of zero, which means that they do not save for the consumption of the next generation. Saving, or in this case, protecting the environment is not good politics in small coalition systems. With these different assumptions and arguments in place, the first hypothesis that comes from this reasoning is stated as follows:

***H1: Leaders who get into office through open competition and participation are more likely to produce SHD relative to leaders whose tenure does not depend on open competition and participation.***

It is important to note that this hypothesis (a) applies to all countries and (b) all regime types, so it does not concentrate on democracies only nor does it divide the world between democracies and autocracies. In this way, countries with high levels of DG are ruled by a larger coalition that has been put in power by a large selectorate.

However, public goods can increase the productivity of individuals, whose output is an important source of revenue for any government. Therefore, there is an argument for the provision of public goods, including the protection of the environment, even in the case of autocracies. Moreover, increasing the provision of public goods can minimize the threat of revolution, as the population would be less dissatisfied with the incumbent leader (Bueno de Mesquita and Smith 2009b, 2010). However, the increase in revenues comes at a price for autocrats, as public goods can facilitate communication and coordination among potential rebels; for this reason leaders may also have some incentives to cut back on the provision of public goods.

Whether leaders increase or restrain the provision of public goods depends on government revenues. On the one hand, leaders with access to free resources such as minerals or fungible foreign aid have few incentives to increase public goods, as revenues are obtained without the participation of the population. On the other hand, leaders without access to free resources rely on the productivity of their population.

This logic suggests that leaders with access to free resources do not have incentives to provide sustainable development, as they rely on the income provided by minerals and foreign aid (e.g. an oil-rich country investing in wind turbines simply does not make sense). As long as leaders have access to these resources, they do not have incentives to invest in sustainability. For the same reason, reducing certain kinds of foreign aid is likely to produce more investment in protecting the environment. These assumptions and arguments thus lead to our second hypothesis, which can be stated as follows.

***H2: Leaders whose tenure does not depend on open competition and participation but do not rely on free resources are more likely to produce SHD relative to leaders in a similar political context who rely on free resources.***

This hypothesis is not a restatement of the ‘resource curse’ arguments, but sees **DG** interacting with resource endowments in important ways, such that the main relationship between **DG** and **SHD** is conditioned by the country resource endowments. The multivariate statistical analysis in this study can model this interaction effect and control for the possible confounding effects of resource endowments.

The purely rational economic explanations such as these are joined by more institutional arguments, which assume that democratic institutions constrain leaders in ways that prevent them from undermining processes of sustainable human development. Such constraint comes in the form of both public and group constraint as leaders face vested interests within democratic institutions and public interest in the outcomes of policies that have an impact on sustainable human development.

Across different political systems, legislative chambers are comprised of different sets of interests and are more or less susceptible to the penetration of interest groups into the affairs of government. Group and public constraints can limit the ability for governing elites to pursue policies that intentionally undermine sustainable human development. The public can place further constraints on governing elites within a democratic framework through the exercise of the vote. Unpopular leaders can be voted out of office. These arguments are a variant of the ‘political survival’ arguments outlined above. The key variable is the degree to which executives are constrained (parliamentary oversight, constraints on the use of the veto, and limits on autonomy to form cabinets), which leads to our third hypothesis, which can be stated as follows:

***H3: Political systems with more constraints on the executive are better for overseeing policies that are good for SHD.***

These constraints are complemented further through informational constraints. Democracies and the notion of democratic governance are based on the free flow of information through the protection of rights to free speech, free press, freedom of association and freedom of assembly. The availability of information is ever increasing and becoming more democratic with the advent of ‘new’ technologies, such as social media and smart phones, where it is becoming increasingly difficult for governments to hide activities that are not in the public interest.

The informational constraint in a setting of democratic governance is a key assumption behind Amartya Sen’s (1999) claim that no democracy has ever suffered from a famine. The consequences of famine are highly visible, tend to affect a large proportion of a country’s population and cannot be hidden from view. In countries with a free flow of information and the ability to challenge incumbents, there are incentives for governing elites who wish to stay in power to ensure that polices are pursued that promote human development. The emphasis on these basic democratic freedoms leads to our fourth hypothesis, which can be stated as follows:

***H4: Political systems with a greater protection of rights to free speech, assembly, and association are better for SHD.***

The final argument for a connection between democratic governance and sustainable human development is a normative one based on a set of **democratic values** that place human well-being at their core. This argument draws on a Kantian tradition that civic republic systems have a commitment to a set of norms and values that make them different than other systems. Social constructivist theories argue that democracies share this set of values and in the international sphere make them more likely to be peaceful in the inter-state relations (see e.g. Russet and Oneal 2001; Rosato 2003). Davenport (2007) has extended the logic to the domestic realm to show that democracies respond to domestic conflict situations with lower levels of repression and a greater respect for human rights. We believe that this logic also applies in the promotion of SHD:

***H5: countries with a more fully developed democratic culture and deep commitment to democratic values are better for SHD.***

Taken together, these five hypotheses are the formal ways which **DG** ought to be related to **SHD**, *ceteris paribus*. We view them as a collective set of arguments that will be tested through our model estimations and reported as part of the next phase of this project.

# Empirical Analysis

The main relationship between **DG** and **SHD** is tested using a pooled cross-section time-series data set for 168 countries between 1980 and 2010. This kind of data set is now standard across analyses in the social sciences and provides significant between-country and within-country variation to test the relationship, as well as a large number of observations to control for potential confounding factors and rival explanations. The inclusion of time-series data allows us to test the over time changes in DG and SHD and the different empirical relationships between them.

Given the definitions for democratic governance and sustainable human development outlined above, the data set has multiple measures for each concept as outlined above and a series of control variables, all of which are detailed in Table 1. Our analysis begins with a series of charts that depict the bivariate relationships between different dimensions of **DG** and **SHD**. We use simple scatter plots and kernel ‘density’ plots to show whether there are significant differences in **SHD** across different dimensions of **DG**.

It then proceeds to multivariate analysis that allows us to test for significant relationships between DG and SHD, while controlling for possible confounding effects from additional variables. The analysis used the variables in Table 1 and created some interaction effects between the indicators for DG and development. This part of the analysis used a fixed effects estimator for pooled cross-section time-series data, a multiple imputation algorithm to alleviate the problem of missing data, and modified the standard errors to account for non-independent observations within countries (see the **Technical Annex** for a full explanation of the method of estimation and all output for the various regression equations).

## Bivariate Analysis

Using some of the key dimensions of **DG** and **SHD** it is possible to map out relationships between the two using density plots and scatter plots. A density plot compares frequency distributions (or smoothed histograms) for some of our indicators for **SHD** across different dimensions of **DG**. The plots allow for a comparison of means across different dimensions of **DG** as well as a comparison of the dispersion around the mean. The scatter plots provide a good visual first cut at simple relationships and depict the magnitude and goodness of fit for the relationship of interest.

### DG and Human-Related Dimensions of SHD

Comparing the human development index across the *executive competitiveness* measure from the Polity IV data set (see Figure 1) shows that the density for the HDI has a higher mean and tighter dispersion for those countries with higher levels of executive competiveness.

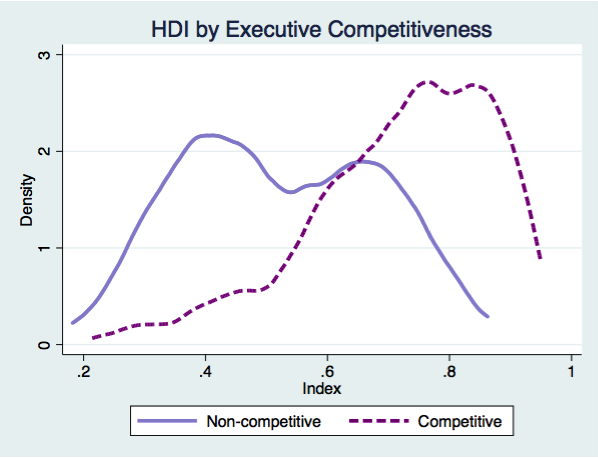


Figure 1. Kernel Density Plot for HDI by Executive Competitiveness

Two scatterplots for the HDI across different dimensions of **DG** show a positive relationship for democratic political institutions (Figure 2a) and the protection of physical integrity rights (Figure 2b).

|  |  |
| --- | --- |
| Figure 2a: HDI and political institutions  0 = full autocracy; 1 = full democracy  (Linear fit with 95% confidence interval) | Figure 2b: HDI and physical integrity rights  0 = systematic violation; 8 = full protection  (Linear fit with 95% confidence interval) |

|  |  |  |  |
| --- | --- | --- | --- |
| Table 1. Indicators for DG and SHD used in the analysis | | | |
|  | | Data set | Source |
| Country name | | World Bank Development Indicators |  |
| Country id | | Correlates of War/CIRI Human Rights data project | <http://www.correlatesofwar.org/>; <http://ciri.binghamton.edu/> |
| Year | |  |  |
| **DEMOCRATIC GOVERNANCE** | |  |  |
| Autocracy-democracy measure | | Polity IV | <http://www.systemicpeace.org/inscr/inscr.htm> |
| Executive competitiveness | |
| Executive openness | |
| Executive constraints | |
| Competitiveness of participation | |
| Regulation of participation | |
| Physical integrity rights | | CIRI Human Rights data project | <http://ciri.binghamton.edu/> |
| **SUSTAINABLE HUMAN DEVELOPMENT** | |  |  |
| HDI components: | Life expectancy | UNDP: International Human Development Indicators | [http://hdrstats.undp.org/en/indicators/](http://hdrstats.undp.org/en/indicators/20206.html) |
|  | Mean yrs of schooling |
| Expected yrs of schooling |
| GDP-PC (constant 2005 Int $) |
| Human demand measure | Consumption | Ecological Footprint | [www.footprintnetwork.org](http://www.footprintnetwork.org/) |
| Production |
| Biocapity |
| Forest Area (% land mass) | | World Bank: World Development Indicators | <http://data.worldbank.org/indicator/> |
| Organic water pollution emissions (kg per worker per day) | | World Bank: World Development Indicators | <http://data.worldbank.org/indicator/> |
| Fossil fuel energy consumption (% per year) | | World Bank: World Development Indicators | <http://data.worldbank.org/indicator/> |
| CO2 emissions | | World Bank: World Development Indicators | <http://data.worldbank.org/indicator/> |
| Nightlights | |  | <http://www.ngdc.noaa.gov/dmsp/pubs.php> |
| Caloric intake | | FAO: Dietary Energy, Protein and Fat (31.10.2011) | <http://www.fao.org/economic/ess/ess-fs/fs-data/ess-fadata/en/> |
| Income inequality | | University of Texas: Estimated Household Income Inequality | <http://utip.gov.utexas.edu/data.html> |
| **CONTROL VARIABLES** | |  |  |
| Mineral dependency | Salt, sulphur, earth | United Nations Commodity Trade Statistics Database | <http://data.un.org/Explorer.aspx?d=ComTrade&f=_l1Code%3a26%3bcmdCode%3a251990> |
|  | Pearls, precious stones |
| Ores, slag & ash |
| Mineral fuels, oils etc |
| Population size | | World Bank: World Development Indicators | <http://data.worldbank.org/indicator/> |
| Region | |
| International war | | Correlates of War | <http://www.correlatesofwar.org/> |
| Civil War | |
| Total foreign aid | | World Bank: World Development Indicators | <http://data.worldbank.org/indicator/DT.ODA.ALLD.CD?display=graph> |

The plots for calorie intake are more telling and show a degree of differentiation as a function of levels of national income (per capita GDP) and dimensions of **DG**. Figure 3a shows that rich countries with high levels of participation and competitiveness have the highest overall levels of calorie intake, followed by rich non-competitive countries, poor competitive countries and poor non-competitive countries. It is obvious that wealthier countries will have higher levels of calorie intake, but within the two groups of countries (rich and poor) it those with higher levels of competitiveness that outperform those without.

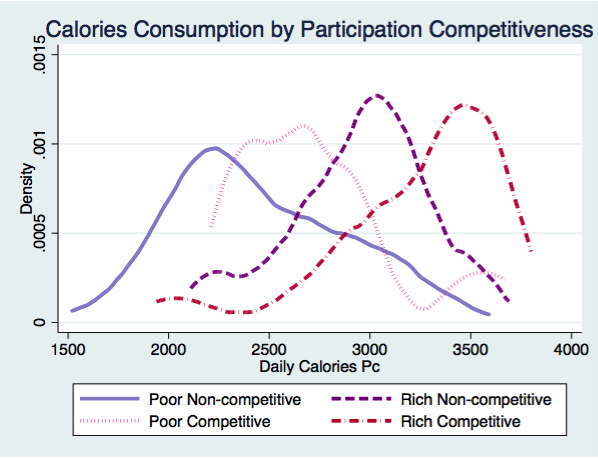


Figure 3a: Calorie consumption and participation competitiveness

Complementing these findings, the scatter plots for calorie intake for political institutions (Figure 3b) and the protection of physical integrity rights (Figure 3c) also show the positive associations of these aspects of **DG** with this human-related dimension of **SHD**. Indeed, the slope for the level of physical integrity rights protection is slightly higher than for political institutions, suggesting a stronger inter-relationship between rights protection and well-being (See also Landman and Larizza 2009).

|  |  |
| --- | --- |
| Figure 3b: Calorie intake and political institutions  0 = full autocracy; 1 = full democracy  (Linear fit with 95% confidence interval) | Figure 3c: Calorie intake and physical integrity rights  0 = systematic violation; 8 = full protection  (Linear fit with 95% confidence interval) |

### Environment-Related Dimensions of SHD

The plots for the human-related dimensions of **SHD** show the overall benefits of **DG** for HDI and calorie consumption. The relationships for environment-related dimensions of SHD are not as straightforward and like the plots for caloric intake, need to take into account levels of national income (per capita GDP).

The kernel density plot for forest area and executive competitiveness (Figure 4a) shows that more competitive systems tend to a have larger forest area; a difference that is supported by the scatter plot between forest area and political institutions (Figure 4b).

|  |  |
| --- | --- |
| Figure 4a: Forest area and executive competitiveness  0 = no competition; 1 = fully competitive  (Large mean and less dispersion) | Figure 4b: Forest area and political institutions  0 = full autocracy; 1 = full democracy  (Linear fit with 95% confidence interval) |

For organic water pollutants, both the kernel density plot (Figure 5a) and the scatter plot (Figure 5b) show that more competitive and better rights-protective countries produce less water pollution than non-competitive and repressive countries; however, the difference in means for water pollution is not particularly large even though the dispersion for countries with higher levels of executive competitiveness is smaller than for those with lower levels of executive competitiveness.

|  |  |
| --- | --- |
| Figure 5a: Organic water pollutants and executive competitiveness  0 = no competition; 1 = fully competitive  (Similar means, but less dispersion for competitive countries) | Figure 5b: Organic water pollutants and physical integrity rights  0 = systematic violation; 8 = full protection  (Linear fit with 95% confidence interval) |

The density plots for fossil fuel consumption (Figure 6a) and CO2 emissions (Figure 6b), which themselves are a function of levels of national income show that among the wealthy countries those with higher levels of competitiveness and regulation of participation perform slightly better. This relationship is more evident for fossil fuel consumption than CO2 emissions, and even in the case of fuel consumption, the **DG** difference applies more forcefully to rich countries than to poor countries.

|  |  |
| --- | --- |
| Figure 6a: Fossil fuel consumption and participation competitiveness  (Difference in means by level of development) | Figure 6b: CO2 emissions and participation regulation  (Difference in means by level of development) |

## Multivariate Analysis

Since our data set has a large number of observations across time and space, we have estimated a series of models that explore the relationship between different dimensions of **DG** and **SHD**, while controlling for possible confounding effects. As we shall see, the findings from the bivariate analysis on the positive effects for different dimensions of **DG** will partly hold in the multivariate analysis, where higher levels of **DG** are good for human development and caloric intake, but are highly qualified for their relationship with the environmental dimensions of **SHD**.

Owing to the problem of missing data for our set of indicators, we have used a ‘multiple imputation’ algorithm (see Honaker, King and Blackwell 2012) alongside a fixed effects least squares estimator that includes standard errors that are robust to non-independent observations for each country in the data set. The technical annex includes summary statistics for all the variables after imputation (Table A1) and the full model estimations for the human-related indicators of **SHD** (Table A2 and Table A3) and environment-related indicators of **SHD** (Table A4 through Table A8).

The purpose of multivariate analysis is to explore the primary relationship between different dimensions of **DG** and **SHD** while including additional variables that may also account for the observed variation in **SHD** across our sample. If the relationships are upheld for **DG** in the presence of these additional variables, then we may be more confident in our inferences than for the simpler relationships depicted in the previous section of this report. The analysis also allows us to compare across the different dimension of **DG** to gauge the relative importance of each dimension for its relationship with **SHD**.

Figure 7 shows the overall model for the relationships between the various dimensions of both **DG** and **SHD** and the control variables, which include population size, natural resource dependence and economic development. Our working hypotheses are that each of the different dimensions of **DG** will have a beneficial relationship with **SHD**, even after controlling for the positive effects of the control variables. In addition, some of models include ‘interaction effects’ between particular dimensions of **DG** and the economic control variables (natural resource dependence and economic development). Inclusion of interaction effects makes sense, as the bivariate analysis in the previous section showed that for some of our indicators for **SHD**, economic factors interact with governance factors and produce a differentiation in results accordingly.



Figure 7: model for DG and human-related dimensions of SHD

### Modeling DG and Human-related dimensions of SHD

For the human development index and caloric intake, the findings from the regression analysis (see Tables A2 and A3) show that there are positive and significant findings for most of the dimensions of **DG**. Those with the strongest relationship with HDI are *executive competitiveness* and *executive constraints* and for caloric intake are *executive competitiveness*, *regulation of participation* and *executive constraints*. The indicator *executive openness* is non-significant for HDI and negative and significant for caloric intake. HDI is also related to natural resource dependence, but we found no significant evidence for an interaction effect between high levels of democracy and resource dependence.

Together, the results for these two human-related indicators for **SHD** show a strong set of positive relationships with **DG** in ways that are expected from the theoretical discussion above. Greater competition and constraint on executives and participation play a key role in the achievement of higher levels of human development and caloric intake, which lends support to the UNDP’s argument that democratic governance is good for sustainable human development.

### Modeling DG and Environment-related dimensions of SHD

The results for the environment-related indicators of SHD are much less straightforward than those for the human-related indicators (see Tables A3 to A8). These indicators are quite diverse and include measures for forests, water, fossil fuel consumption, CO2 emissions and an overall ‘ecological footprint’. The interaction between population, consumption and human socio-economic systems are complex already (Royal Society 2012: 7), and this report adds questions of democratic governance alongside this complexity.

Economically, it is not surprising that the level of wealth of a country is positively related to its fossil fuel consumption, CO2 emissions, and a higher ecological footprint, but such countries do have larger forest areas and better water quality. But how do higher levels of democratic governance relate to these indicators and how does **DG** interact with economic development?

Those indicators of **DG** for which there are two or more significant *beneficial* relationships with environment indicators of **SHD** include *executive openness* and *regulation of participation*. There are significant negative relationships (i.e. harmful) **DG** that are further mediated by interaction effects. For example, systems with high levels of *executive competitiveness*, *executive constraints*, and *participation competitiveness* have reduced forest areas, greater fuel consumption, and higher CO2 emissions; however, these harmful relationships are significantly reduced for wealthy countries with these attributes of **DG**. Such results mean that any simple statements about the benefits of democratic governance for environment-related indicators for SHD must be tempered by further reference to levels of wealth.

# Summary and Implications

This report has examined the connections between democratic governance and sustainable human development through the use of a popular set of publicly available indicators. It provided an overview of each concept and the theoretical connections postulated about why democratic governance would be good for sustainable human development. The report’s findings are based on a comprehensive set of analyses on a pooled time-series cross-section data set of these indicators for 168 countries between 1980 and 2010 (total *N*\**T* = 5343).

Across the bivariate and multivariate analysis presented here, the findings suggest that higher levels of democratic governance are indeed good for some aspects of sustainable human development. The more consistent findings for the democratic governance have been for the human-related dimensions of sustainable human development. Table 2 visualizes the findings from the multivariate analyses in summary and nontechnical fashion.

In the table, the indicators for **DG** are listed in the first column and the indicators for the different dimensions of **SHD** are listed across the remaining columns. Under each indicator for **SHD**, the table shows the ‘sign’ that corresponds to a good outcome for **SHD**. For example, positive (or higher) levels of HDI and caloric intake are considered good for **SHD**, and negative (or lower) levels of water pollution and CO2 emissions are considered good for **SHD**. Where the findings for the different indicators for DG are in line with the theoretical expectations, the cell in the table is shaded blue.

In some cases, the findings overall are not in line with expectations, but the interaction effects show that rich groups of countries with these **DG** attributes are less bad for **SHD** than other combinations of factors. In other cases, the findings overall are in line with expectations, but some of the rich groups of countries with these **DG** attributes are actually worse for **SHD**.

These findings make a case for the work of the UNDP in enhancing democratic governance as part of its overall development programming. The findings show that governance interventions in the form of assessments and support for reform should concentrate on the following areas:

1. the competitiveness of executive recruitment and selection procedures
2. the constraints on arbitrary exercise of executive authority
3. the ways in which participation is organized
4. the protection of physical integrity rights

It is also clear for the findings here, however, that much more work needs to be done on the connections between democratic governance and the environment-related dimensions of sustainable human development. A recent report from the Royal Society in the United Kingdom (2012: 9) entitled *People and the Planet* argues that human development must not be decoupled from the environment, as any large scale demographic and economic changes will have a necessary impact on the environment. The report also sees the need for governments to ‘develop socio-economic systems and institutions that are not dependent on continued material consumption growth.’ The coupling of people, the environment *and* governance as the date approaches for the *Rio +20 Conference on Sustainable Development* thus seems of paramount importance. The UNDP’s work on governance in the future must include both the human- and environment-related dimensions of sustainable human development.

Table 2. Meta-analysis of findings for the relationship between democratic governance (DG) and sustainable human development (SHD)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Indicators for DG** | **Indicators for sustainable human development (SHD)\*** | | | | | | |
|  | HDI  (+ = good) | Caloric intake  (+ = good) | Forest area  (+ = good) | Water pollution  (- = good) | Fuel consumption  (- = good) | CO2 emissions  (- = good) | Ecological footprint  (- = good) |
| Executive  competitiveness | + | + | -  (better for rich competitive)† |  | +  (better for rich competitive) | -  (worse for rich competitive) | -  (worse for rich competitive) |
| Executive  openness |  | - | + | + | - | +  (better for rich competitive) |  |
| Executive  constraints | + | + | -  (better for rich constraints) |  | +  (better for rich competitive) | +  (better for rich competitive) |  |
| Participation regulation | + | + | + | -  (worse for rich competitive) | +  (better for rich competitive) | -  (worse for rich competitive) |  |
| Participation competitiveness |  | + | -  (better for rich competitive) |  | +  (better for rich competitive) | +  (better for rich competitive) |  |
| Physical  integrity rights | + | + | + |  |  |  | -  (worse for rich competitive) |
| Democracy-autocracy  scale | + | + | -  (better for rich democracies) |  | +  (better for rich democracies) | +  (better for rich competitive) |  |

\*Statistically significant *beneficial* relationships for DG are marked in blue.

†Notes in parentheses refer to qualified results for the interaction effects between DG and economic development, which refer to the group of ‘rich-competitive’ countries.

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# A Note on the Authors

**Professor Todd Landman, Project Director**

Todd Landman, BA (UPenn), MA (Georgetown), MA (Colorado), PhD (Essex) is Professor of Government and Director of the Institute for Democracy and Conflict Resolution at the University of Essex. He is author of *Human Rights and Democracy: The Precarious Triumph of Ideals* (forthcoming Bloomsbury), *Protecting Human Rights* (Georgetown 2005), *Studying Human Rights* (Routledge 2006), and *Issues and Methods in Comparative Politics* (Routledge 2000, 2003, 2008); co-author of *Measuring Human Rights* (Routledge 2009), *Assessing the Quality of Democracy* (International IDEA 2008); *Governing Latin America* (2003), and *Citizenship Rights and Social Movements* (Oxford 1997, 2000); editor of *Human Rights Volumes I-IV* (Sage 2009), and co-editor of the *Sage Handbook of Comparative Politics* (Sage 2009) and *Real Social Science: Applied Phronesis* (Cambridge 2012).

He has numerous articles published in *International Studies Quarterly*, *The British Journal of Political Science*, *Human Rights Quarterly*, *Democratization*, *Political Studies*, *The Journal of Human Rights*, *The British Journal of Politics and International Relations*, *Electoral Studies*, *Human Rights and Human Welfare*, *Public Law* and *The California Western International Law Journal*.

As a political methodologist, Professor Landman has carried out a large number of international consultancies over the last 15 years in the areas of development, democracy and human rights with an emphasis on quantitative methods and analysis. In particular, he has worked for the UNDP in Mongolia as part of its work on democratic governance assessment (ICNRD-5) and the development of Democratic Governance Indicators (GDIs). He has authored *Indicators for Human Rights Based Approaches to Development in UNDP Programming: A Users Guide* (UNDP 2006) and was a panellist at the Oslo Governance Forum in November 2011.

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**Dr Alejandro Quiroz Flores, Data Analyst**

Alejandro Quiroz Flores, BA (CIDE, Mexico), MPhil (Oxford), MA (New York University), PhD (New York University) is a Lecturer in Government at the University of Essex. He is a specialist in international relations, political economy and political methodology. His research has focused on government survival and cabinet change, the termination of wars, and the political economy of military expenditure. He is currently working on a project that analyses surviving disasters and has applied advanced econometric analysis to all of his work. He has also been Chief, Department of Strategic Science and Technology Policy, National Council for Science and Technology, Mexico; a Contributor to Jane’s Information Group; and Research Assistant, Samuel Dillon and Julia Preston, *The New York Times*.

Dr Flores’ role in the project is primarily estimating the models linking democratic governance and sustainable human development. He will also contribute to the literature review and the development of the theoretical framework, with a particular emphasis on the political economy approaches to governance and development. His work on political survival and structures of incentives for key actors in government is crucial for understanding the possible links between democratic governance and sustainable human development.

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**Dr Dorothea Farquhar, Project Assistant**

Dorothea Farquhar, BA (Essex), MA (Essex), PhD (Essex) trained as an accountant and spent several years in finance and administration, latterly as operations manager for an international examinations board. She returned to higher education to study politics. Her MA dissertation examines declining voter turnout in the UK in the post-war period and her doctoral thesis explores evidence for changing attitude structures in the British electorate. She is Assistant to the Director of the IDCR, Professor Todd Landman. She has worked with Professor Landman on a five-year DFID-funded project on parliamentary strengthening and has conducted market analysis for the University of Essex. Her data analysis skills include the identification, collation and analysis of primary data; the secondary analysis of large data sets; the analysis of quantitative data using inferential statistics particularly the application of multiple and logistic regression; exploratory and confirmatory factor analyses to test hypotheses; and statistical modelling using SPSS, Stata and AMOS packages.

# Technical Annex

This Annex contains all the data analysis used in the report, including summary statistics for the variables used in the analysis after running the multiple imputation algorithm, and the various regression estimations for the different indicators for DG and SHD.

Multiple Imputation (MI) is a simulation procedure used to address missing data in order to produce valid statistical inference. Imputations are repeated draws from the posterior predictive distribution of the missing data. This report assumes that the pattern of missing values is arbitrary and hence uses iterative methods to fill in missing values according to a multivariate normal distribution for the variables of interest. Although the theory for this method is based on an infinite number of imputations, this report used 5 imputations, which is sufficient for valid inferences.

The procedure consists of three steps. First, the analyst chooses an imputation model which will produce M imputations or equivalently, M completed datasets. Second, model estimation is completed for each completed dataset. Finally, the analyses from the M completed datasets are pooled together into a single MI result. These are the results presented in tables throughout the report. For more details, see Honaker, J., King, G., and Blackwell, M. (2012) and the Stata Manual for the ‘mi’ command, which also includes references to papers that are related to MI.

## Table A1. Descriptive statistics of the variables used in the analysis

|  |  |  |  |
| --- | --- | --- | --- |
| **Variable** | **Mean** | **Standard Deviation** | **N** |
| HDI | 0.601 | 0.187 | 27796 |
| Forest Area | 29.712 | 23.383 | 27067 |
| Organic Water Pollutants | 0.193 | 0.064 | 27334 |
| Fossil Fuel | 61.129 | 31.9 | 30204 |
| CO2 Emissions | 4.506 | 6.78 | 30755 |
| Footprint | 2.992 | 3.892 | 30927 |
| Calories Consumption | 2627.504 | 537.554 | 28253 |
| Demaut | 0.573 | 0.367 | 30873 |
| ln(GDPpc) | 8.451 | 1.316 | 27923 |
| Executive Competition | 1.827 | 1.118 | 30873 |
| Executive Openness | 3.239 | 1.461 | 30873 |
| Executive Constraints | 4.323 | 2.286 | 30873 |
| Participation Regulation | 3.433 | 1.124 | 30873 |
| Participation Competitiveness | 2.933 | 1.495 | 30873 |
| Physical Integrity | 4.828 | 2.307 | 30782 |
| Resources | 3.415 | 8.637 | 31046 |
| ln(Popopualtion) | 15.888 | 1.608 | 31537 |
| Growth | 0.071 | 0.154 | 30875 |

## Table A2. Regression estimates for Democratic Governance and Human Development

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | I | II | III | IV | V | VI | VII |
| Demaut | 0.1954\*\*\* |  |  |  | 0.1758\*\*\* | 0.2023\*\*\* |  |
|  | (0.024) |  |  |  | (0.022) | (0.025) |  |
| ln(Population) | 0.0014 | 0.0066 | 0.0033 | 0.0009 | 0.0084 | -0.0011 | 0.0029 |
|  | (0.007) | (0.006) | (0.007) | (0.007) | (0.006) | (0.007) | (-0.005) |
| Growth | 0.0100 | 0.0126 | 0.0115 | 0.0146 | 0.0126 | 0.0009 | 0.0021 |
|  | (0.026) | (0.026) | (0.027) | (0.026) | (0.026) | (0.026) | (-0.027) |
| ExecutiveCompetitiveness |  | 0.0681\*\*\* |  |  |  |  | 0.0289\*\*\* |
|  |  | (0.008) |  |  |  |  | (-0.01) |
| ExecutiveOpenness |  | -0.0043 |  |  |  |  | 0.0053 |
|  |  | (0.004) |  |  |  |  | (-0.004) |
| ExecutiveConstraints |  |  | 0.0319\*\*\* |  |  |  | 0.0126\*\*\* |
|  |  |  | (0.003) |  |  |  | (-0.003) |
| ParticipationRegulation |  |  |  | 0.0132\*\*\* |  |  | 0.0263\*\*\* |
|  |  |  |  | (0.005) |  |  | (-0.004) |
| ParticipationCompetitiveness |  |  |  | 0.0502\*\*\* |  |  | 0.0197\*\*\* |
|  |  |  |  | (0.006) |  |  | (-0.005) |
| PhysicalIntegrity |  |  |  |  | 0.0100\*\*\* |  | 0.0058\*\* |
|  |  |  |  |  | (0.002) |  | (-0.002) |
| Resources |  |  |  |  |  | 0.0027\*\*\* | 0.0030\*\*\* |
|  |  |  |  |  |  | (0.001) | (-0.001) |
| (Demaut)(Resources) |  |  |  |  |  | -0.0029\*\*\* | -0.0026\*\*\* |
|  |  |  |  |  |  | (0.001) | (-0.001) |
| Intercept | 0.4661\*\*\* | 0.3850\*\*\* | 0.4095\*\*\* | 0.3931\*\*\* | 0.3175\*\*\* | 0.4986\*\*\* | 0.2477\*\*\* |
|  | (0.102) | (0.095) | (0.101) | (0.107) | (0.090) | (0.100) | (-0.082) |
| N | 5343 | 5343 | 5343 | 5343 | 5343 | 5343 | 5343 |
| Imputations | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| Countries | 168 | 168 | 168 | 168 | 168 | 168 | 168 |
| Unstandardised coefficients reported; standard errors in parentheses; \* p<0.10, \*\* p<0.05, \*\*\* p<0.01 | | | | | | | |

## Table A3. Regression estimates for Democratic Governance and Caloric Intake

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | I | II | III | IV | V | VI | VII |
| Demaut | 249.3402\*\*\* |  |  |  | 170.7817\*\* | 277.3485\*\*\* |  |
|  | (68.496) |  |  |  | (72.377) | (71.751) |  |
| ln(Population) | 21.5227 | 30.7241 | 23.0637 | 24.4388 | 49.5645\*\* | 16.4366 | 43.1339\*\* |
|  | (22.290) | (21.349) | (22.399) | (22.673) | (20.494) | (22.104) | (-19.543) |
| Growth | 162.8839\*\* | 163.0438\*\* | 163.1694\*\* | 176.6293\*\*\* | 173.6592\*\*\* | 143.2120\*\* | 152.3730\*\* |
|  | (64.321) | (64.705) | (63.525) | (65.435) | (64.570) | (67.344) | (-68.46) |
| ExecutiveCompetitiveness |  | 113.2886\*\*\* |  |  |  |  | 41.2630\* |
|  |  | (26.981) |  |  |  |  | (-24.107) |
| ExecutiveOpenness |  | -46.6154\*\*\* |  |  |  |  | -31.1174\*\* |
|  |  | (15.757) |  |  |  |  | (-15.279) |
| ExecutiveConstraints |  |  | 42.8035\*\*\* |  |  |  | 41.3325\*\*\* |
|  |  |  | (10.586) |  |  |  | (-14.649) |
| ParticipationRegulation |  |  |  | 73.7055\*\*\* |  |  | 91.1024\*\*\* |
|  |  |  |  | (21.617) |  |  | (-18.589) |
| ParticipationCompetitiveness |  |  |  | 75.2744\*\*\* |  |  | 9.8268 |
|  |  |  |  | (14.835) |  |  | (-13.365) |
| PhysicalIntegrity |  |  |  |  | 39.8852\*\*\* |  | 29.5303\*\*\* |
|  |  |  |  |  | (8.853) |  | (-8.27) |
| Resources |  |  |  |  |  | 7.1751\*\*\* | ( 7.4701\*\*\*) |
|  |  |  |  |  |  | (2.531) | (-2.351) |
| (Demaut)(Resources) |  |  |  |  |  | -10.5468\*\*\* | -9.8436\*\*\* |
|  |  |  |  |  |  | (3.963) | (-3.547) |
| Intercept | 2133.6660\*\*\* | 2074.3019\*\*\* | 2066.8964\*\*\* | 1755.3133\*\*\* | 1539.1785\*\*\* | 2194.0813\*\*\* | 1287.7008\*\*\* |
|  | (352.132) | (344.637) | (357.314) | (338.137) | (324.230) | (350.734) | (-301.823) |
| N | 5343 | 5343 | 5343 | 5343 | 5343 | 5343 | 5343 |
| Imputations | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| Countries | 168 | 168 | 168 | 168 | 168 | 168 | 168 |
| Unstandardised coefficients reported; standard errors in parentheses; \* p<0.10, \*\* p<0.05, \*\*\* p<0.01 | | | | | | | |

## Table A4. Regression estimates for Democratic Governance and Forest Area

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | I | II | III | IV | V | VI | VII |
| Demaut | -64.4019\*\*\* |  |  |  | -77.4073\*\*\* | -60.6959\*\*\* | |
|  | (12.101) |  |  |  | (11.404) | (13.374) |  |
| ln(GDPpc)(Demaut) | 8.8872\*\*\* |  |  |  | 10.4450\*\*\* | 8.2971\*\*\* | |
|  | (1.381) |  |  |  | (1.395) | (1.752) |  |
| ln(GDPpc) | -4.7068\*\* | -0.0401 | -3.8562\* | -0.6471 | -0.9433 | -4.2455\* | 5.3076\*\*\* |
|  | (2.084) | (1.765) | (2.019) | (3.561) | (3.132) | (2.337) | (-1.966) |
| ln(Population) | -1.4946 | -1.1718 | -1.2504 | -1.2243 | -1.6090 | -1.4225 | -0.9117 |
|  | (1.043) | (0.907) | (1.008) | (1.030) | (1.080) | (1.099) | (-1.08) |
| Growth | 1.7977 | 1.2881 | 1.4311 | 1.4723 | 1.8240 | 1.9988 | 1.3256 |
|  | (5.345) | (5.520) | (5.523) | (5.218) | (5.456) | (5.443) | (-5.486) |
| TimeTrend | -0.1741 | -0.1310 | -0.1518 | -0.1672 | -0.1632 | -0.1658 | -0.0972 |
|  | (0.176) | (0.192) | (0.188) | (0.174) | (0.175) | (0.164) | (-0.157) |
| TimeTrend^2 | 0.0053 | 0.0041 | 0.0048 | 0.0054 | 0.0049 | 0.0049 | 0.0036 |
|  | (0.005) | (0.006) | (0.005) | (0.005) | (0.005) | (0.005) | (-0.005) |
| ExecutiveCompetitiveness |  | -24.7390\*\* |  |  |  |  | -1.828 |
|  |  | (12.084) |  |  |  |  | (-20.315) |
| ExecutiveOpenness |  | 13.9987\*\* |  |  |  |  | 13.2885\* |
|  |  | (6.946) |  |  |  |  | (-7.063) |
| ln(GDPpc)(ExecutiveCompetitiveness) |  | 3.5138\*\* |  |  |  |  | 0.7489 |
|  |  | (1.584) |  |  |  |  | (-2.699) |
| ln(GDPpc)(ExecutiveOpenness) |  | -1.8771\* |  |  |  |  | -1.9015\* |
|  |  | (0.990) |  |  |  |  | (-1.004) |
| ExecutiveConstraints |  |  | -7.2812\*\*\* |  |  |  | -4.6392 |
|  |  |  | (2.060) |  |  |  | (-6.454) |
| ln(GDPpc)(ExecutiveConstraints) |  |  | 1.0346\*\*\* |  |  |  | 0.5614 |
|  |  |  | (0.229) |  |  |  | (-0.769) |
| ParticipationRegulation |  |  |  | 9.8348 |  |  | 10.9756\* |
|  |  |  |  | (6.162) |  |  | (-6.561) |
| ParticipationCompetitiveness |  |  |  | -16.9545\*\*\* |  |  | -16.8248\*\*\* |
|  |  |  |  | (2.752) |  |  | (-4.663) |
| ln(GDPpc)(ParticipationRegulation) |  |  |  | -1.4149\*\* |  |  | -1.4190\* |
|  |  |  |  | (0.642) |  |  | (-0.726) |
| ln(GDPpc)(ParticipationCompetitiveness) |  |  |  | 2.1659\*\*\* |  |  | 1.9812\*\*\* |
|  |  |  |  | (0.356) |  |  | (-0.619) |
| PhysicalIntegrity |  |  |  |  | 8.1642\* |  | 6.8357 |
|  |  |  |  |  | (4.225) |  | (-4.434) |
| ln(GDPpc)(PhysicalIntegrity) |  |  |  |  | -0.9918\* |  | -0.8005 |
|  |  |  |  |  | (0.518) |  | (-0.553) |
| Resources |  |  |  |  |  | -0.1835 | -0.2525 |
|  |  |  |  |  |  | (0.186) | (-0.178) |
| (Demaut)(Resources) |  |  |  |  |  | 0.3951 | 0.4829 |
|  |  |  |  |  |  | (0.409) | (-0.382) |
| Intercept | 86.3192\*\*\* | 44.7316\*\* | 75.1905\*\*\* | 57.4651 | 58.0517\* | 82.0204\*\*\* | 2.8404 |
|  | (23.700) | (21.257) | (21.723) | (37.407) | (29.934) | (26.923) | (-26.104) |
| N | 5343 | 5343 | 5343 | 5343 | 5343 | 5343 | 5343 |
| Imputations | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| Countries | 168 | 168 | 168 | 168 | 168 | 168 | 168 |
| Unstandardised coefficients reported; standard errors in parentheses; \* p<0.10, \*\* p<0.05, \*\*\* p<0.01 | | | | | | | |

## Table A5. Regression estimates for Democratic Governance and Water Pollution

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | I | II | III | IV | V | VI | VII |
| Demaut | 0.0534 |  |  |  | 0.0552 | 0.0453 |  |
|  | (0.100) |  |  |  | (0.116) | (0.105) |  |
| ln(GDPpc)(Demaut) | -0.0022 |  |  |  | -0.0020 | -0.0014 |  |
|  | (0.012) |  |  |  | (0.014) | (0.013) |  |
| ln(GDPpc) | -0.0227\*\*\* | -0.0162\*\* | -0.0217\*\*\* | -0.0534\*\*\* | -0.0236\*\*\* | -0.0237\*\*\* | -0.0388\*\*\* |
|  | (0.007) | (0.008) | (0.008) | (0.008) | (0.005) | (0.008) | (-0.011) |
| ln(Population) | -0.0073\*\*\* | -0.0051\*\* | -0.0068\*\* | -0.0081\*\*\* | -0.0084\*\*\* | -0.0075\*\*\* | -0.0079\*\*\* |
|  | (0.003) | (0.002) | (0.003) | (0.003) | (0.003) | (0.003) | (-0.003) |
| Growth | 0.0049 | 0.0063 | 0.0056 | 0.0069 | 0.0047 | 0.0028 | 0.006 |
|  | (0.008) | (0.009) | (0.008) | (0.009) | (0.008) | (0.008) | (-0.009) |
| TimeTrend | 0.0011\*\* | 0.0015\*\*\* | 0.0014\*\* | 0.0010\* | 0.0011\*\* | 0.0009\* | 0.0004 |
|  | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) | (0.000) | (0.000) |
| TimeTrend^2 | -0.0000 | -0.0000\*\* | -0.0000\* | -0.0000 | -0.0000 | -0.0000\* | 0 |
|  | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| ExecutiveCompetitiveness |  | -0.0216 |  |  |  |  | -0.073 |
|  |  | (0.044) |  |  |  |  | (-0.088) |
| ExecutiveOpenness |  | 0.0228\*\* |  |  |  |  | 0.0315\*\* |
|  |  | (0.011) |  |  |  |  | (-0.016) |
| ln(GDPpc)(ExecutiveCompetitiveness) |  | 0.0045 |  |  |  |  | 0.0081 |
|  |  | (0.005) |  |  |  |  | (-0.011) |
| ln(GDPpc)(ExecutiveOpenness) |  | -0.0049\*\*\* |  |  |  |  | -0.0055\*\*\* |
|  |  | (0.001) |  |  |  |  | (-0.002) |
| ExecutiveConstraints |  |  | 0.0071 |  |  |  | 0.0292 |
|  |  |  | (0.017) |  |  |  | (-0.039) |
| ln(GDPpc)(ExecutiveConstraints) |  |  | -0.0004 |  |  |  | -0.0029 |
|  |  |  | (0.002) |  |  |  | (-0.005) |
| ParticipationRegulation |  |  |  | -0.0659\*\*\* |  |  | -0.0650\*\* |
|  |  |  |  | (0.020) |  |  | (-0.026) |
| ParticipationCompetitiveness |  |  |  | -0.0123 |  |  | -0.0232 |
|  |  |  |  | (0.018) |  |  | (-0.017) |
| ln(GDPpc)(ParticipationRegulation) |  |  |  | 0.0069\*\*\* |  |  | 0.0066\*\* |
|  |  |  |  | (0.002) |  |  | (-0.003) |
| ln(GDPpc)(ParticipationCompetitiveness) |  |  |  | 0.0021 |  |  | 0.0037\* |
|  |  |  |  | (0.002) |  |  | (-0.002) |
| PhysicalIntegrity |  |  |  |  | -0.0039 |  | 0.0034 |
|  |  |  |  |  | (0.011) |  | (-0.013) |
| ln(GDPpc)(PhysicalIntegrity) |  |  |  |  | 0.0002 |  | -0.0006 |
|  |  |  |  |  | (0.001) |  | (-0.002) |
| Resources |  |  |  |  |  | 0.0004 | -0.0001 |
|  |  |  |  |  |  | (0.000) | (-0.001) |
| (Demaut)(Resources) |  |  |  |  |  | 0.0009\* | 0.0016\*\*\* |
|  |  |  |  |  |  | (0.001) | (-0.001) |
| Intercept | 0.4724\*\*\* | 0.4259\*\*\* | 0.4565\*\*\* | 0.7701\*\*\* | 0.5049\*\*\* | 0.4844\*\*\* | 0.6909\*\*\* |
|  | (0.092) | (0.088) | (0.100) | (0.097) | (0.076) | (0.093) | (-0.127) |
| N | 5343 | 5343 | 5343 | 5343 | 5343 | 5343 | 5343 |
| Imputations | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| Countries | 168 | 168 | 168 | 168 | 168 | 168 | 168 |
| Unstandardised coefficients reported; standard errors in parentheses; \* p<0.10, \*\* p<0.05, \*\*\* p<0.01 | | | | | | | |

## Table A6. Regression estimates for Democratic Governance and Fossil Fuel Consumption

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | I | II | III | IV | V | VI | VII |
| Demaut | 28.3090\* |  |  |  | 25.1797 | 28.7403\* |  |
|  | (15.710) |  |  |  | (16.695) | (16.085) |  |
| ln(GDPpc)(Demaut) | -3.8945\*\* |  |  |  | -3.7050\* | -3.9947\*\* |  |
|  | (1.882) |  |  |  | (1.959) | (1.936) |  |
| ln(GDPpc) | 10.8234\*\*\* | 7.1917\*\*\* | 11.3301\*\*\* | 18.6119\*\*\* | 11.8654\*\*\* | 10.8752\*\*\* | 16.5325\*\*\* |
|  | (1.317) | (1.519) | (1.512) | (2.110) | (1.430) | (1.377) | (-2.7) |
| ln(Population) | 2.1028 | 1.5946 | 2.0069 | 2.1241\* | 2.5061\* | 2.1205 | 2.2077\* |
|  | (1.273) | (1.346) | (1.268) | (1.197) | (1.281) | (1.293) | (-1.294) |
| Growth | -5.3268\*\* | -5.5140\*\* | -5.4594\*\* | -5.5221\*\* | -5.2322\*\* | -5.4272\*\* | -6.0584\*\*\* |
|  | (2.272) | (2.384) | (2.312) | (2.187) | (2.193) | (2.311) | (-2.284) |
| TimeTrend | 0.3576\* | 0.3430\* | 0.3177 | 0.3345 | 0.3870\* | 0.3452\* | 0.4125\* |
|  | (0.207) | (0.195) | (0.203) | (0.217) | (0.212) | (0.204) | (-0.211) |
| TimeTrend^2 | -0.0110\* | -0.0107\*\* | -0.0103\* | -0.0106\* | -0.0115\*\* | -0.0111\* | -0.0124\*\* |
|  | (0.006) | (0.005) | (0.006) | (0.006) | (0.006) | (0.006) | (-0.006) |
| ExecutiveCompetitiveness |  | 24.1198\*\*\* |  |  |  |  | 13.8588\* |
|  |  | (8.318) |  |  |  |  | (-8.179) |
| ExecutiveOpenness |  | -14.7229\*\* |  |  |  |  | -13.5481\*\* |
|  |  | (5.825) |  |  |  |  | (-5.736) |
| ln(GDPpc)(ExecutiveCompetitiveness) |  | -3.2973\*\*\* |  |  |  |  | -1.688 |
|  |  | (1.039) |  |  |  |  | (-1.065) |
| ln(GDPpc)(ExecutiveOpenness) |  | 2.3179\*\*\* |  |  |  |  | 2.1485\*\*\* |
|  |  | (0.740) |  |  |  |  | (-0.739) |
| ExecutiveConstraints |  |  | 5.2839\*\* |  |  |  | 4.2355 |
|  |  |  | (2.449) |  |  |  | (-3.734) |
| ln(GDPpc)(ExecutiveConstraints) |  |  | -0.6701\*\* |  |  |  | -0.6589 |
|  |  |  | (0.293) |  |  |  | (-0.437) |
| ParticipationRegulation |  |  |  | 16.6481\*\*\* |  |  | 19.3264\*\*\* |
|  |  |  |  | (3.695) |  |  | (-3.507) |
| ParticipationCompetitiveness |  |  |  | 12.5612\*\*\* |  |  | 6.9598 |
|  |  |  |  | (4.256) |  |  | (-5.876) |
| ln(GDPpc)(ParticipationRegulation) |  |  |  | -1.7540\*\*\* |  |  | -2.0167\*\*\* |
|  |  |  |  | (0.405) |  |  | (-0.381) |
| ln(GDPpc)(ParticipationCompetitiveness) |  |  |  | -1.4505\*\*\* |  |  | -0.7876 |
|  |  |  |  | (0.493) |  |  | (-0.722) |
| PhysicalIntegrity |  |  |  |  | 2.9762 |  | 0.6431 |
|  |  |  |  |  | (1.991) |  | (-1.985) |
| ln(GDPpc)(PhysicalIntegrity) |  |  |  |  | -0.2703 |  | 0.0095 |
|  |  |  |  |  | (0.216) |  | (-0.207) |
| Resources |  |  |  |  |  | -0.0206 | 0.0986 |
|  |  |  |  |  |  | (0.088) | (-0.084) |
| (Demaut)(Resources) |  |  |  |  |  | 0.1762 | 0.0629 |
|  |  |  |  |  |  | (0.129) | (-0.131) |
| Intercept | -62.5912\*\* | -34.7730 | -65.7694\*\* | -136.9800\*\*\* | -80.3337\*\*\* | -63.0471\*\* | -134.7509\*\*\* |
|  | (25.884) | (27.630) | (26.991) | (31.121) | (27.193) | (26.680) | (-38.144) |
| N | 5343 | 5343 | 5343 | 5343 | 5343 | 5343 | 5343 |
| Imputations | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| Countries | 168 | 168 | 168 | 168 | 168 | 168 | 168 |
| Unstandardised coefficients reported; standard errors in parentheses; \* p<0.10, \*\* p<0.05, \*\*\* p<0.01 | | | | | | | |

## Table A6. Regression estimates for Democratic Governance and Fossil Fuel Consumption

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | I | II | III | IV | V | VI | VII |
| Demaut | 9.0524\*\*\* |  |  |  | 11.8855\*\*\* | 8.0778\*\*\* |  |
|  | (2.272) |  |  |  | (2.558) | (1.980) |  |
| ln(GDPpc)(Demaut) | -1.2804\*\*\* |  |  |  | -1.6655\*\*\* | -1.1447\*\*\* |  |
|  | (0.301) |  |  |  | (0.337) | (0.261) |  |
| ln(GDPpc) | 2.4225\*\*\* | 2.4360\*\*\* | 2.2229\*\*\* | 1.8071\*\*\* | 1.6228\*\*\* | 2.2991\*\*\* | 1.9871\*\*\* |
|  | (0.345) | (0.408) | (0.364) | (0.572) | (0.297) | (0.319) | (-0.625) |
| ln(Population) | -0.3325 | -0.3891 | -0.3777 | -0.3433 | -0.1834 | -0.3572 | -0.2519 |
|  | (0.347) | (0.345) | (0.351) | (0.338) | (0.337) | (0.343) | (-0.321) |
| Growth | 0.5156 | 0.6528 | 0.5619 | 0.5658 | 0.5219 | 0.3745 | 0.6457 |
|  | (0.737) | (0.745) | (0.752) | (0.761) | (0.711) | (0.720) | (-0.738) |
| TimeTrend | 0.0492 | 0.0344 | 0.0418 | 0.0685\* | 0.0528 | 0.0374 | 0.0619\* |
|  | (0.037) | (0.036) | (0.038) | (0.037) | (0.036) | (0.036) | (-0.037) |
| TimeTrend^2 | -0.0011 | -0.0008 | -0.0009 | -0.0015 | -0.0011 | -0.0010 | -0.0015 |
|  | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) | (-0.001) |
| ExecutiveCompetitiveness |  | -2.8836\*\* |  |  |  |  | -9.0336\*\*\* |
|  |  | (1.363) |  |  |  |  | (-2.79) |
| ExecutiveOpenness |  | 3.6830\*\*\* |  |  |  |  | 4.1096\*\*\* |
|  |  | (1.217) |  |  |  |  | (-1.294) |
| ln(GDPpc)(ExecutiveCompetitiveness) |  | 0.3448\*\* |  |  |  |  | 1.1635\*\*\* |
|  |  | (0.166) |  |  |  |  | (-0.354) |
| ln(GDPpc)(ExecutiveOpenness) |  | -0.4882\*\*\* |  |  |  |  | -0.5263\*\*\* |
|  |  | (0.157) |  |  |  |  | (-0.167) |
| ExecutiveConstraints |  |  | 0.9484\*\*\* |  |  |  | 0.5397 |
|  |  |  | (0.334) |  |  |  | (-0.646) |
| ln(GDPpc)(ExecutiveConstraints) |  |  | -0.1363\*\*\* |  |  |  | -0.076 |
|  |  |  | (0.044) |  |  |  | (-0.081) |
| ParticipationRegulation |  |  |  | -1.6996\* |  |  | -1.5706\* |
|  |  |  |  | (0.964) |  |  | (-0.881) |
| ParticipationCompetitiveness |  |  |  | 2.9166\*\*\* |  |  | 5.2860\*\*\* |
|  |  |  |  | (0.736) |  |  | (-1.387) |
| ln(GDPpc)(ParticipationRegulation) |  |  |  | 0.2779\*\* |  |  | 0.2564\*\*\* |
|  |  |  |  | (0.109) |  |  | (-0.097) |
| ln(GDPpc)(ParticipationCompetitiveness) |  |  |  | -0.3846\*\*\* |  |  | -0.6922\*\*\* |
|  |  |  |  | (0.089) |  |  | (-0.174) |
| PhysicalIntegrity |  |  |  |  | -1.5377\*\*\* |  | -0.8862\*\* |
|  |  |  |  |  | (0.422) |  | (-0.423) |
| ln(GDPpc)(PhysicalIntegrity) |  |  |  |  | 0.2102\*\*\* |  | 0.1260\*\* |
|  |  |  |  |  | (0.051) |  | (-0.051) |
| Resources |  |  |  |  |  | 0.0500\* | 0.0418\* |
|  |  |  |  |  |  | (0.025) | (-0.023) |
| (Demaut)(Resources) |  |  |  |  |  | -0.0160 | 0.0029 |
|  |  |  |  |  |  | (0.051) | (-0.047) |
| Intercept | -9.8664\*\* | -8.8243\* | -7.5853 | -6.9640 | -6.6152 | -8.5174\* | -10.2297\*\* |
|  | (4.902) | (5.133) | (4.942) | (4.605) | (4.946) | (4.632) | (-4.789) |
| N | 5343 | 5343 | 5343 | 5343 | 5343 | 5343 | 5343 |
| Imputations | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| Countries | 168 | 168 | 168 | 168 | 168 | 168 | 168 |
| Unstandardised coefficients reported; standard errors in parentheses; \* p<0.10, \*\* p<0.05, \*\*\* p<0.01 | | | | | | | |

## Table A6. Regression estimates for Democratic Governance and CO2 Emissions

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | I | II | III | IV | V | VI | VII |
| Demaut | -4.8470 |  |  |  | -3.1631 | -5.3844 |  |
|  | (3.543) |  |  |  | (3.252) | (3.643) |  |
| ln(GDPpc)(Demaut) | 0.5958 |  |  |  | 0.3996 | 0.6786 |  |
|  | (0.399) |  |  |  | (0.376) | (0.414) |  |
| ln(GDPpc) | 0.3450\* | 0.2834 | 0.1811 | 0.9785\*\* | -0.1619 | 0.2790 | 0.1744 |
|  | (0.181) | (0.202) | (0.236) | (0.439) | (0.237) | (0.189) | -0.419 |
| ln(Population) | -0.3960\*\* | -0.4071\*\* | -0.4009\*\* | -0.3741\*\* | -0.3914\*\* | -0.4103\*\* | -0.3915\*\* |
|  | (0.172) | (0.173) | (0.172) | (0.169) | (0.176) | (0.170) | -0.168 |
| Growth | 0.2566 | 0.2860 | 0.2593 | 0.1836 | 0.2503 | 0.2137 | 0.2031 |
|  | (0.282) | (0.287) | (0.290) | (0.268) | (0.296) | (0.279) | -0.307 |
| TimeTrend | -0.0119 | -0.0121 | -0.0153 | -0.0105 | -0.0144 | -0.0147 | -0.0136 |
|  | (0.028) | (0.026) | (0.026) | (0.027) | (0.026) | (0.028) | -0.025 |
| TimeTrend^2 | 0.0004 | 0.0004 | 0.0005 | 0.0004 | 0.0005 | 0.0005 | 0.0005 |
|  | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) | -0.001 |
| ExecutiveCompetitiveness |  | -1.8570\*\* |  |  |  |  | -0.0627 |
|  |  | (0.775) |  |  |  |  | -1.606 |
| ExecutiveOpenness |  | 0.0839 |  |  |  |  | -0.4142 |
|  |  | (0.593) |  |  |  |  | -0.746 |
| ln(GDPpc)(ExecutiveCompetitiveness) |  | 0.2236\*\*\* |  |  |  |  | 0.0041 |
|  |  | (0.084) |  |  |  |  | -0.209 |
| ln(GDPpc)(ExecutiveOpenness) |  | 0.0024 |  |  |  |  | 0.0629 |
|  |  | (0.084) |  |  |  |  | -0.1 |
| ExecutiveConstraints |  |  | -0.8900 |  |  |  | -1.0288 |
|  |  |  | (0.612) |  |  |  | -0.861 |
| ln(GDPpc)(ExecutiveConstraints) |  |  | 0.1130 |  |  |  | 0.1446 |
|  |  |  | (0.070) |  |  |  | -0.106 |
| ParticipationRegulation |  |  |  | 1.2330 |  |  | 1.1718 |
|  |  |  |  | (0.868) |  |  | -0.776 |
| ParticipationCompetitiveness |  |  |  | -0.3845 |  |  | 1.4194\*\* |
|  |  |  |  | (0.669) |  |  | -0.623 |
| ln(GDPpc)(ParticipationRegulation) |  |  |  | -0.1326 |  |  | -0.1222 |
|  |  |  |  | (0.102) |  |  | -0.093 |
| ln(GDPpc)(ParticipationCompetitiveness) |  |  |  | 0.0555 |  |  | -0.1882\*\* |
|  |  |  |  | (0.078) |  |  | -0.077 |
| PhysicalIntegrity |  |  |  |  | -1.1146\*\* |  | -1.1656\*\* |
|  |  |  |  |  | (0.473) |  | -0.546 |
| ln(GDPpc)(PhysicalIntegrity) |  |  |  |  | 0.1327\*\* |  | 0.1388\*\* |
|  |  |  |  |  | (0.052) |  | -0.062 |
| Resources |  |  |  |  |  | 0.0264\*\*\* | 0.0265\*\* |
|  |  |  |  |  |  | (0.009) | -0.01 |
| (Demaut)(Resources) |  |  |  |  |  | -0.0435\*\* | -0.0426\* |
|  |  |  |  |  |  | (0.021) | -0.024 |
| Intercept | 6.1885\*\* | 6.5483\*\* | 7.4719\*\* | 0.0741 | 10.2568\*\*\* | 6.8824\*\* | 6.4386 |
|  | (2.939) | (3.024) | (3.226) | (3.949) | (3.884) | (2.961) | -4.48 |
| N | 5343 | 5343 | 5343 | 5343 | 5343 | 5343 | 5343 |
| Imputations | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| Countries | 168 | 168 | 168 | 168 | 168 | 168 | 168 |
| Unstandardised coefficients reported; standard errors in parentheses; \* p<0.10, \*\* p<0.05, \*\*\* p<0.01 | | | | | | | |

## Table A6. Regression estimates for Democratic Governance and Ecological Footprint

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | I | II | III | IV | V | VI | VII |
| Demaut | -4.8470 |  |  |  | -3.1631 | -5.3844 |  |
|  | (3.543) |  |  |  | (3.252) | (3.643) |  |
| ln(GDPpc)(Demaut) | 0.5958 |  |  |  | 0.3996 | 0.6786 |  |
|  | (0.399) |  |  |  | (0.376) | (0.414) |  |
| ln(GDPpc) | 0.3450\* | 0.2834 | 0.1811 | 0.9785\*\* | -0.1619 | 0.2790 | 0.1744 |
|  | (0.181) | (0.202) | (0.236) | (0.439) | (0.237) | (0.189) | (-0.419) |
| ln(Population) | -0.3960\*\* | -0.4071\*\* | -0.4009\*\* | -0.3741\*\* | -0.3914\*\* | -0.4103\*\* | -0.3915\*\* |
|  | (0.172) | (0.173) | (0.172) | (0.169) | (0.176) | (0.170) | (-0.168) |
| Growth | 0.2566 | 0.2860 | 0.2593 | 0.1836 | 0.2503 | 0.2137 | 0.2031 |
|  | (0.282) | (0.287) | (0.290) | (0.268) | (0.296) | (0.279) | (-0.307) |
| TimeTrend | -0.0119 | -0.0121 | -0.0153 | -0.0105 | -0.0144 | -0.0147 | -0.0136 |
|  | (0.028) | (0.026) | (0.026) | (0.027) | (0.026) | (0.028) | (-0.025) |
| TimeTrend^2 | 0.0004 | 0.0004 | 0.0005 | 0.0004 | 0.0005 | 0.0005 | 0.0005 |
|  | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) | (-0.001) |
| ExecutiveCompetitiveness |  | -1.8570\*\* |  |  |  |  | -0.0627 |
|  |  | (0.775) |  |  |  |  | (-1.606) |
| ExecutiveOpenness |  | 0.0839 |  |  |  |  | -0.4142 |
|  |  | (0.593) |  |  |  |  | (-0.746) |
| ln(GDPpc)(ExecutiveCompetitiveness) |  | 0.2236\*\*\* |  |  |  |  | 0.0041 |
|  |  | (0.084) |  |  |  |  | (-0.209) |
| ln(GDPpc)(ExecutiveOpenness) |  | 0.0024 |  |  |  |  | 0.0629 |
|  |  | (0.084) |  |  |  |  | (-0.1) |
| ExecutiveConstraints |  |  | -0.8900 |  |  |  | -1.0288 |
|  |  |  | (0.612) |  |  |  | (-0.861) |
| ln(GDPpc)(ExecutiveConstraints) |  |  | 0.1130 |  |  |  | 0.1446 |
|  |  |  | (0.070) |  |  |  | (-0.106) |
| ParticipationRegulation |  |  |  | 1.2330 |  |  | 1.1718 |
|  |  |  |  | (0.868) |  |  | (-0.776) |
| ParticipationCompetitiveness |  |  |  | -0.3845 |  |  | 1.4194\*\* |
|  |  |  |  | (0.669) |  |  | (-0.623) |
| ln(GDPpc)(ParticipationRegulation) |  |  |  | -0.1326 |  |  | -0.1222 |
|  |  |  |  | (0.102) |  |  | (-0.093) |
| ln(GDPpc)(ParticipationCompetitiveness) |  |  |  | 0.0555 |  |  | -0.1882\*\* |
|  |  |  |  | (0.078) |  |  | (-0.077) |
| PhysicalIntegrity |  |  |  |  | -1.1146\*\* |  | -1.1656\*\* |
|  |  |  |  |  | (0.473) |  | (-0.546) |
| ln(GDPpc)(PhysicalIntegrity) |  |  |  |  | 0.1327\*\* |  | 0.1388\*\* |
|  |  |  |  |  | (0.052) |  | (-0.062) |
| Resources |  |  |  |  |  | 0.0264\*\*\* | 0.0265\*\* |
|  |  |  |  |  |  | (0.009) | (-0.01) |
| (Demaut)(Resources) |  |  |  |  |  | -0.0435\*\* | -0.0426\* |
|  |  |  |  |  |  | (0.021) | (-0.024) |
| Intercept | 6.1885\*\* | 6.5483\*\* | 7.4719\*\* | 0.0741 | 10.2568\*\*\* | 6.8824\*\* | 6.4386 |
|  | (2.939) | (3.024) | (3.226) | (3.949) | (3.884) | (2.961) | (-4.48) |
| N | 5343 | 5343 | 5343 | 5343 | 5343 | 5343 | 5343 |
| Imputations | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| Countries | 168 | 168 | 168 | 168 | 168 | 168 | 168 |
| Unstandardised coefficients reported; standard errors in parentheses; \* p<0.10, \*\* p<0.05, \*\*\* p<0.01 | | | | | | | |

1. These more positive studies are contrasted with studies that find curvilinear relationships (i.e. a kind of Kuznets curve between democracy and inequality), negative relationships, or minimal relationships (see, e.g. Li and Reuveny 2003). [↑](#footnote-ref-1)
2. The Bruntland Commission, *Report of the World Commission on Environment and Development (WCED) Our Common Future*; <http://www.un-documents.net/ocf-02.htm>; Accessed 05 February 2012. [↑](#footnote-ref-2)