Migration, Openness and the Global Preconditions of 'Smart Development'*

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Abstract

We present a first empirical reflection on smart development,' its measurement, possible drivers and bottlenecks.' We first provide cross-national data on how much ecological footprint is used in the nations of the world system to deliver a given amount of democracy, economic growth, gender equality, human development, research and development, and social cohesion. To this end, we first developed UNDP-type performance indicators on these six main dimensions of development and on their combined performance. We then show the non-linear regression trade-offs between ecological footprints per capita on these six dimensions of development and their combined performance index. The residuals from these regressions are our new measures of smart development (a country experiences smart development, if it achieves a maximum development with a minimum of ecological footprint). We then look at the cross-national drivers and bottlenecks of this smart development and compare their predictive power using stepwise regression procedures. Apart from important variables and indicators, derived from sociological dependency and world systems theories, we also test the predictive power of several other predictors as well. Our estimates underline the enormous importance of the transfer of resources from the center to the periphery, brought about by migration, with huge statistical observed positive effects of received worker remittances on smart human development, Happy Life Years, smart gender justice, smart R&D, and both formulations of the smart development index.

Keywords: index numbers and aggregation, environment and development, environment and trade, smart development, sustainability, environmental accounts and accounting, environmental equity, population growth international migration, remittances.

JEL Classification Numbers: C43, F22, F24, Q56.

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Göç, Dışa Açıklık ve "Akıllı Kalkınma"nın Global Önkoşulları

Özet

Bu makalede, akıllı kalkınma, akıllı kalkınmanın ölçümü, etkileyen faktörler ve darboğazlar hakkında ilk ampirik bulgularımızı sunmaktayız. Çalışmada kullanılan veri, dünya sistemi uluslarının, belli bir demokrasi, iktisadi büyüme, cinsiyet eşitliği, insani gelişme, araştırma-geliştirme ve sosyal dayanışma seviyesini sunabilmek için ne kadar ekolojik ayak izi kullandıklarına dair uluslararası yatay kesit sunmaktadır. Bu amaçla, önce kalkınmanın bu altı boyutu için ve bunların kombine edilmiş performansı için UNDP benzeri performans göstergeleri geliştirdik. Ardından, kalkınmanın altı boyutu ve bu boyutların kombine edilmiş performans endeksi için, kişi başına düşen ekolojik ayak izine dair non-lineer regresyon ödünleşmelerini göstermekteyiz. Bu regresyonların artıkları, akıllı kalkınmanın yeni ölçütlerini oluşturmakta: Bir ülke eğer minimum ekolojik ayak izi ile maksimum kalkınma elde edebiliyorsa, akıllı kalkınmayı deneyimlemekte demektir. Bunun ardından, ulusların "akıllı kalkınması"nı etkileyen faktörleri ve darboğazları incelemekte ve bunların sahip oldukları öngörü gücünü adım adım regresyon metoduyla karşılaştırmaktayız. Sosyoloji kökenli bağımlılık ve dünya sistemi kuramlarından elde edilen önemli değişken ve göstergelerin yanı sıra, başka pek çok kestirim faktörünün öngörü gücünü de test etmekteyiz. Tahminlerimiz, göç nedeniyle kaynakların merkezden çepere olan transferinin muazzam öneminin altını çizmektedir. Ayrıca, işçi dövizlerinin; akıllı kalkınma, Mutlu Yaşam Yılları, akıllı cinsiyet eşitliği, akıllı araştırma-geliştirme ve akıllı kalkınma endeksinin iki göstergesi üzerindeki büyük istatistiki pozitif etkisini de ortaya koymaktadır.

Anahtar kelimeler: endeksler ve veri birleştirme, çevre ve kalkınma, çevre ve ticaret, akıllı kalkınma, sürdürülebilirlik, çevre hesapları ve muhasebesi, çevresel adalet, nüfus büyümesi, uluslararası göç, işçi dövizi.

JEL Sınıflandırması: C43, F22, F24, Q56.

In this article, we present a first empirical reflection on 'smart development', and its measurement and its possible drivers and bottlenecks. The very idea of smart development was first proposed by Meadows (1992). The basic idea was that we should relate our whole concept of development, and not just economic growth, to the natural resources needed to sustain it. In a similar vein, the Happy Planet Organization presented the so-called 'Happy Planet Index' (HPI), an index of measuring the trade-off between ecological footprint data and life quality (Happy Life Years, HLYE). Arguably, the ecological footprint today is the best single international yardstick for measuring environmental destruction in a nation (see also York, Rosa, and Dietz, 2003). In presenting possible theories explaining smart development, we deal in particular with the concept of 'openness' or 'world economic openness' and the issue of migration.

Economic theory takes into account the non-linearity of the trade-off between income and happiness, with rising income levels not necessarily increasing the happiness of all. This phenomenon has become widely known in the economic research literature

as the 'Easterlin paradoxon' (Easterlin, 1995, 2001; Frey and Stutzer, 2002; Oswald, 1997; Stevenson and Wolfers, 2007). But here, we provide the first cross-national data including how much ecological footprint is used in the nations of the world system to deliver a given amount of democracy, economic growth, gender equality, human development, research and development, and social cohesion.

To this end, we first developed UNDP-type performance indicators from data on the six main dimensions of development (democracy, economic growth, gender equality, human development, research and development, and social cohesion) and on the combined performance in these six dimensions. We then show the non-linear standard OLS regression trade-offs between ecological footprints per capita and their square on these six components of development and the overall development performance index derived from them. The residuals from these regressions are our new measures of smart development: A country experiences smart development if it achieves a maximum of democracy, economic growth, gender equality, human development, research and development, and social cohesion, and the combination of them with a minimum of ecological footprint.

We then look at the cross-national drivers and bottlenecks of this smart development using standard comparative cross-national data. We compare the predictive power of these standard predictors, using standard OLS stepwise regression procedures. Apart from important variables and indicators derived from sociological dependency and world systems theories, we also test the predictive power of other predictors as well, ranging from geography and achieved development levels to the clash of civilization models, feminist theories, migration theories, and the 'small is beautiful paradigm' in the tradition of Schumacher.

The outline of the research includes a possible theoretical background, the measurement concepts and methodology, the results of drivers and bottlenecks to smart development, the results of earlier theories and relevant research, and finally our conclusions.

Theoretical Background and Earlier Studies

To present a theory or competing theories of smart development is virtually impossible because there has been no measurement of its cross-national successes and failures in the literature up to now.

In this presentation of possible theories explaining smart development, we now should deal with the notion of openness. Among the studies, we find these to be relevant: Alesina, Spolaore and Wacziarg (2000); Dollar, (1992a and 1992b); Edwards (1993); Frankel and Romer (1999); Rodrik (2006); Rodrik, Subramanian, and Trebbi (2004); and World Bank (2005). Dollar's writings were especially straightforward in suggesting that a high share of exports and imports per GDP, and hence an outward orientation, is especially beneficial for economic growth and that it works in favor of the poorest strata of the population. The study by Frankel and Romer (1999) comes to a more cautious conclusion regarding the direction of causation between trade and income. According to that study, the countries' geographic characteristics, however, have important effects

on trade. Frankel and Romer then construct measures of the geographic component of the countries' trade to estimate the effect of trade on income. They suggest that trade has a quantitatively large and robust positive effect on income.

Rodrik, Subramanian, and Trebbi (2004) further shattered the optimistic assumptions about the beneficial effects of world economic openness on development outcomes in their study about the respective contributions of institutions, geography, and trade in determining income levels around the world. Their results indicate that 'the quality of institutions "trumps" everything else' (Rodrik, Subramanian, and Trebbi, 2004). Once institutions are accounted for, conventional measures of geography have at best weak direct effects on incomes. Similarly, once institutions are accounted for, trade is almost always insignificant, and often enters the income equation with the "wrong" (i.e., negative) sign. Rodrik (2006) fundamentally questions the 'Washington Consensus' based on open markets which featured so prominently in Dollar (1992a and 1992b).

The issue of migration equally divides opinions around the globe and among the global social science research community.[1] As is well-known, migration is part and parcel of the 'four freedoms' of capitalism including those of goods, services, and capital. It is only logical to treat its possible influence on smart development. Migration assures continued production and hence also pollution in the migration recipient countries; while worker remittances might contribute to overall consumption, well-being and investment in environmentally more sustainable housing and heating systems in the migration-sending nations. A survey of the hitherto existing migration theories (Massey et al., 1993) came to the pessimistic conclusion that migration theories were either advanced to explain the initiation of international migration or were put forth to account for the persistence of migration across space and time. Massey et al. suggested that the theories are not inherently logically inconsistent.

As Taylor pointed out in his summarizing policy statement on the state of migration theory for the United Nations in 2006, indeed it would be foolish to exclude migration from any future discourse about global development: The number of international migrants has increased more or less linearly over the past 40 years, from an estimated 76 million in 1965 to 188 million in 2005. The flow of international migrant remittances has increased more rapidly than the number of international migrants, from an estimated US$2 billion in 1970 to US$216 billion in 2004. Nearly 70% of all remittances go to LDCs. As Taylor also pointed out in a number of other studies, especially in 1999, worker remittances affect the less developed sending countries by a multiplier effect, well-known in economics since the days of John Maynard Keynes (Taylor, 2006: 9). The optimistic view about worker remittances is also supported by Ziesemer (2009). The author shows that the countries with per capita income below $1,200/year benefit most from remittances in the long run because they have the largest impact of remittances on savings, investment and steady-state growth rate. All these effects are much weaker for the richer countries.

The *UNDP HDR 2009* edition maintains that financial remittances are vital in im-

[1] Appendix Tables 1a and 1b highlight the theoretical dimensions of this paper. Among the many existing theories, we highlight here especially migration and its possible links to smart development.

proving the livelihoods of millions of people in developing countries. There is a positive contribution of international remittances to household welfare, nutrition, food, health and living conditions in the migrants' places of origin. Even for those whose movements were driven by conflict, their remittances helped entire war-affected communities to survive. In some international migration corridors, money transfer costs have tended to fall over time. Recent innovations have also seen significant decreases in costs at the national level. With the reduction in money transfer costs, formal channels are more frequently used. Important functions of remittances include diversifying sources of income and cushioning families against setbacks such as illness or larger shocks caused by economic downturns, political conflicts or climatic vagaries (*UNDP HDR, 2009: 72*). Similarly, the UNDP also maintains that there should be significant aggregate gains from movement, both to movers and to destination countries in the form of increased population, employment and GDP. Migrants bring broader economic benefits, including higher rates of innovation. Data from the United States show that skilled migrants boosted innovation. The aggregate effect of immigration on the wages of local workers may be positive or negative but is fairly small (*UNDP, HDR, 2009*: 84-85).

Summing up the debate, we refer to the findings of Jeffrey Williamson (2002): that showed that mass migration made an important contribution to late nineteenth century convergence in the 'North.' In the absence of mass migration, real wage dispersion would have increased by 7%, rather than decreased by 28%, as it did in fact. GDP per capita dispersion would also have decreased by only 9%, rather than by 18% as it did in fact. Wage gaps between the New World and the Old would have risen to 128% in 1910 when in fact they declined from 108 to 85%. Real wage convergence before World War I was attributable to migration, to about two-thirds of the GDP per worker convergence, and perhaps to one half of the GDP per capita convergence. There was an additional and even more powerful effect of the mass migrations on global income distribution.

Sanderson (2010) was one of the first consistent research attempts to bring in migration as a determining variable of social well-being. Contemporary levels of international migration in less-developed countries are raising new and important questions regarding the consequences of immigration for human welfare and well-being. Sanderson's contribution was to assess the impact of cumulative international migration flows on the human development index using a series of panel data models to estimate results in a sample of less-developed countries for the period 1970-2005. Those results indicate that higher levels of international migration are associated with lower scores on the human development index, but that the effect is relatively small.

In terms of thoroughly tested scientific knowledge, the next possible alternative theoretical tradition to fill the explanatory gap for smart development accounting would be a dependency and world systems theory. Although its effect on the mainstream economic scholarly journals has been marginal, it has had a very wide impact on the leading international sociological and political science journals. Insufficient space does not permit us to debate at greater length this very vast literature, centered on the subject of MNC (multinational corporation) penetration and economic and social development. Rather, we concentrate on what was actually predicted in the Bornschier/Chase-Dunn/

Rubinson study (1978) that analyzes the effects of MNC penetration on economic growth and income inequality:

> *'(1) The effect of direct foreign investment and aid has been to increase economic inequality within countries. (2) Flows of direct foreign investment and aid have had a short-term effect of increasing the relative rate of economic growth of countries. (3) Stocks of direct foreign investment and aid have had the cumulative, long-term effect of decreasing the relative rate of economic growth of countries. (4) This relationship has been conditional on the level of development of countries. The stocks of foreign investment and aid have had negative effects in both richer and poorer developing countries, but the effect is much stronger within the richer than the poorer ones. (5) These relationships hold independently of geographical area.' (Bornschier/Chase-Dunn/ Rubinson, 1978: 651)*

Important later tests of these hypotheses, taking into account the most influential control variables like initial income levels[2] did nothing but support and refine the original argument, independent of the research design for different indicators, time periods, samples and methods (see *inter alia*: Beer, 1999; Bornschier, 1982, 2002; Dutt, 1997; Heshmati, 2006b; Kentor, 1998; Klitgaard and Fedderke, 1995; Tausch, 2003; Tausch and Prager, 1993; Tsai 1995).

Center-periphery models in the tradition of Prebisch (1950, 1983, 1988) and the classical dependency theories of the 1950s, 1960s and 1970s[3] all can be important elements in the debate about smart development. All these theories claimed that the relations of dependency block long-run economic growth and bring about a socially unbalanced development, short spurts of economic growth notwithstanding.

There has been a real growth industry of blossoming and booming dependency, and with it an increase in world-system oriented studies of environmental problems during the last years. It has become fashionable in many traditions of sociology and political science to blame the lack of sustainable development on globalization and the workings of global capitalism, perceived as a center-periphery system. The central question, posed by Meadows (1992) and by the Happy Planet Index methodology, is how much footprint was consumed in the nations in order to deliver a given amount of development.

Nevertheless, the relatively coherent tendency of these studies[4] suggests that there

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[2] There is also a conventional economic theory of growth accounting, and income inequality practices for such controls. For the convergence effects of poor countries growing faster than richer ones, see Barro, (2003).

[3] The different perspectives include such as Amin's five monopolies of power, Frank's re-orient model, Mariategui's perspective and in the tradition of such authors as Cardoso (1977, 1979), Cardoso/Faletto, (1971), Furtado (1963, 1964, 1976, 1983), Sunkel (1966, 1973, 1978), and the quantitative research inspired by these theories, namely by Galtung, (1971), Sunkel (1973) and later Chase-Dunn (1975), Bornschier/Chase-Dunn/Rubinson (1978) and Bornschier/ Ballmer-Cao (1979).

[4] Most notably Dick and Jorgenson (2010), Jorgenson and Burns (2007), Jorgenson (2003, 2004a, 2004b, 2005, 2006a, 2006b, 2007a, 2007b, 2008, 2009a, 2009b), Jorgenson, and Burns (2004), Jorgenson, Dick, and Mahutga (2007), Jorgenson, Kuykendall, and Kennon (2008), Lawrence (2009), Longo and York (2008), Mostafa and Nataraajan (2009),

seems to be a strong causal interaction between transnational capitalist penetration and environmental degradation, especially in third world countries. To date, the most important counter-study to this school of thought was the essay by Ehrhardt-Martinez, Crenshaw, and Jenkins (2002) which analyzed deforestation rates from 1980 to 1995 in the developing countries, using ordinary least squares regression. Considering the total outcome of the controls for the initial forest stock and the quality of deforestation estimates, the authors find strong evidence for an 'environmental Kuznets' curve[5] driven by (1) agglomeration effects linked to the level of urbanization, (2) rural-to-urban migration that partially offsets rural population pressure, (3) the growth of services-dominated urban economies, and (4) strong democratic states. The authors find little evidence that foreign debt or export dependence influenced the deforestation rate.

A number of high-profile studies in economics have used other control variables (see also Appendix Table 1a and 1b), while the sociological profession seems to be more cautious about their use.[6] The Kuznets curve of economic inequality (Barro, 2000) or environmental degradation (Selden and Song, 1994; Stern, 2004; Stern, Common and Barboer, 1996) must be just as mentioned in this context as is shown in the study by Biswas and Ram (1986) on military expenditures. Also see Ram (1997) on tropical climate; the sociological study by Crenshaw and Robison on population, demography, pre-industrial heritage and socio-linguistic integration as factors of economic growth (also Easterly, 2000; Poe and Tate, 1994); Ram (1986) on government expenditures, and Scanlan (2004) on women in government and on food security and social development (see also *UNDP, HDR, 1995).* Further references from the perspective of feminism and good governance include Holmberg, Rothstein and Nasiritousi, 2009; Logo, 2008; Matt, 2010; McDowell, 1992; Rankin, 2002; Rothstein and Teorell; as well as the survey on women in government and the welfare state in Orloff, 1996. We also should mention culture (for membership of a country in the Islamic Conference [now: Cooperation]see the debate following Huntington, 1993; and by contrast Amin, 1997). A more detailed account of earlier important studies is given in Appendix Table 1b.

Confronted with all this startling variety of contradictory statements on the drivers and bottlenecks of international development, we now present a survey of the empirical methods used in this study.

Mostafa (2010a, 2010b), Nugent and Shandra (2009), Shandra (2007a, 2007b), Shandra and London (2008), Shandra, Leckband, and London (2009), Shandra, Leckband, McKinney, and London (2009), Shandra, London, Whooley, and Williamson (2004), and finally Shandra, Shor, and London (2008, 2009).

[5] The Kuznets curve rests on the idea, proposed by Kuznets (1955) that developmental outcomes (like inequality) are a non-linear function of development levels.

[6] Interested readers are also referred to Easterly (2000, 2002), Easterly and Levine (1997), and Heshmati and Tausch (2007) for further reference.

Methods and Measurements

A brief description of the smart development data and its sources can be accessed electronically.[7] Our investigation duly acknowledges many of the key determinants of economic growth mentioned in the economic literature. Of these sources, we refer to the current shares of the country's inhabitants in total world population; to the famous Heritage Foundation 2000 Economic Freedom Score; to absolute geographical latitude in the UNDP figures for long-term annual population percentage growth rate, 1975-2005; to the trade-off between development level and development performance in the simple Huntingtonian fact of whether a country is a Muslim country as measured by the Organization of Islamic Conference (now: Cooperation) (OIC) Membership or by the Muslim population share (Nationmaster), and to the UNDP data on the simple geographical fact of population density and the public education expenditure per GDP and education index, combining the enrolment rates at the primary, secondary and tertiary education levels. We also take into account figures on military expenditures per GDP and data on military personnel rate which are key variables of contemporary political science international relations theory and peace research. In our analysis, we also show the theoretical and practical (political) potential of the following two drivers of development, migration and European (Monetary) Union membership.

To gain a real empirical knowledge under scrutiny here, we first developed UNDP-type indicators on six dimensions of development and on their combined performance. We then show the non-linear standard OLS regression trade-off between ecological footprint per capita and its square and these six dimensions of development and the overall development performance indices. The residuals from these regressions are our new measure of smart development. With a minimum of ecological footprint one has to achieve a maximum of democracy, or economic growth, or gender equality, or human development, or research and development, or social cohesion, and/or the combination of all of them. We then look at the drivers and bottlenecks of smart development. We use standard comparative cross-national development accounting data which operationalize standard econometric drivers of economic growth, and compare their weight in explaining smart development with the results for the clash of civilization models, political integration theories, feminist theories, migration theories, and peace research approaches to global development. We also analyze the possible explanatory weight of sociological dependency and world systems theories and later globalization critical research, and also do not overlook a possible effect on the smart development - the 'small is beautiful paradigm' in the tradition of Schumacher. A full list of dependent and independent variables appear in Table 1.

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[7] All the original variables are available at: http://www.hichemkaroui.com/?p=2017 and http://www.hichemkaroui.com/?p=2383#more-2383

Table 1

The Combined Six Components, Measuring Development, and the Overall Indicators, Combining 26 Variables

Democracy	1	Combined Failed States Index
Democracy	2	Civil and Political Liberties violations
Democracy	3	Corruption avoidance measure
Democracy	4	Democracy measure
Democracy	5	Global tolerance index
Democracy	6	Rule of law
Economic growth	7	Crisis Performance Factor
Economic growth	8	Economic growth IMF prediction growth rate in 2009
Economic growth	9	Economic growth IMF prediction growth rate in 2010
Economic growth	10	Economic growth in real terms pc. per annum, 1990-2005
Gender equality	11	Closing economic gender gap
Gender equality	12	Closing educational gender gap
Gender equality	13	Closing health and survival gender gap
Gender equality	14	Closing of global gender gap overall score 2009
Gender equality	15	Closing political gender gap
Gender equality	16	Gender empowerment index value
Human development	17	Infant mortality 2005
Human development	18	Female survival probability of surviving to age 65
Human development	19	Human development index (HDI) value 2004
Human development	20	Life Expectancy (years)
Human development	21	Life Satisfaction (0-10)
R&D	22	Country share in top world 500 Universities
R&D	23	Per capita world class universities
R&D	24	Tertiary enrollment
Social cohesion	25	Quintile share income difference between richest and poorest 20%
Social cohesion	26	Unemployment rate
Nonparametric 26 equal weights	27	Overall 26 development index
Nonparametric, weighting each dimension equally	28	Overall 26 development index, based on six dimensions

The choice of a country to be included in the final analysis (175 countries) was determined by the availability of a fairly good data series for these independent variables (if not mentioned otherwise, UNDP data around 2005). In the final regressions, we applied the 'list-wise deletion of missing values' routine. The statistical design of our study is thus based on the usual OLS standard regression analysis of the 'kitchen sink type' (Durlauf et al., 2008; Hertz, Hebert, and Landon, 1994) of economic growth and economic, social and political performance in the research tradition of Barro (2003).[8]

[8] To our knowledge, the term 'kitchen sink regression,' was re-introduced in more recent standard social science journal vocabulary in Laver and Shepsle, (1999).

Surveying the vast econometric literature on the subject of the possible drivers and bottlenecks of the EU-2020 process and overall development performance of a given country, one indeed finds support for the inclusion of geographic and demographic variables in the comparative analysis of development success or failure. Our list thus corresponds to the international research standard praxis in the discipline of general development accounting (Barro and Sala-i-Martin, 2003; Dixon, 1987; Dixon and Moon, 1986, 1989; Durlauf et al., 2008; Fain, 1997; Fosu, 2009, 2010a, 2010b, 2010c; Moon and Dixon, 1992; Shandra, 2007a, 2007b; Shandra et al., 2009; Tausch and Prager, 1993).

Knight and Rosa (2011) compared the ecological footprint per capita and average life satisfaction (as a measure of subjective well-being). Based on maximum likelihood estimations, they tested the effects of climate, political, economic, and social factors on environmental efficiency of well-being (EEWB) with a sample of 105 countries. Knight and Rosa found a negative quadratic effect of economic development on EEWB, a negative effect of income inequality, and a positive effect of social capital.[9]

Compared to (Knight and Rosa, 2011), we include globalization-oriented variables as well, and not just levels of GDP, winters, social trust, democracy, inequality, and Latin America, the former USSR, Africa, and Asia as dummy variables. There is a wide and well-established research tradition in international comparative sociology to include globalization-related drivers of environmental decay (Jorgenson, 2008, 2009a, 2009b, 2009c, 2009d). To exclude such variables and to introduce instead four geographically determined dummy variables does not increase the theoretical and predictive power of analysis.

The statistical design of our study is based on the usual SPSS-PAWS XVIII[10] ordinary least square standard regression of the kitchen sink type. The term was re-introduced in more recent standard social science journal vocabulary in Laver and Shepsle (1999). Prior stepwise regression procedures selected the significant among the total list of 26 available predictors. Among the many international studies that apply to such a research design, we find Hertz, Hebert, and Landon (1994).

Empirical Results

The Relationship between HLYE, EFPC and Development Performance

Since our article does not feature primarily the ecological footprint, but relies on a variety of measures of smart development which are mathematically derived from the logic of the Happy Planet Index (see also Ng, 2008a and 2008b; Veenhoven, 1996), it suffices to say here that the ecological footprint (g ha /cap),[11] is indeed a one-catchall-indicator of ecological strain caused by human activity (see also Dietz et al., 2007 and 2009). The footprint is a measure of the amount of land required to provide for all their resource requirements plus the amount of vegetated land required to sequester (absorb) all their CO_2 emissions and the CO_2 emissions embodied in the products individuals consume. This figure is expressed in units of global hectares. In 2005, the per capita footprint for

[9] http://www.worldvaluessurvey.org/

[10] http://www-01.ibm.com/software/analytics/spss/products/statistics/

[11] http://www.footprintnetwork.org/en/index.php/GFN/

the rich OECD nations was 6.0 global hectares.[12] The other variables are then compared to the footprint which was used by a society to achieve a given standard of democracy, economic growth, gender equality, human development, research and development, and social cohesion. The Happy Planet Index Organization measures the Happy Planet Index on the basis of the global life satisfaction (Happy Life Years) which have to be maximized in relationship to the ecological price of happiness, the ecological footprint.

It is then very tempting to calculate – in a Schumacherian tradition – the environmental price of different development processes like democracy, economic growth, gender equality, human development, research and development, and social cohesion. The Happy Planet Organization calculates the HPI in the following way:

$$HPI_i = \left((HLYE_i)/(EFPC_i + \alpha)\right) \times \beta \quad (1)$$

where Happy Life Years (HLYE) is obtained as both the product of life expectancy (LE) and the average life satisfaction (LS) index. In its currently used formula, the Happy Planet Organization adds a constant (α) to the ecological footprint. The result of the division: [Happy Life Years divided by Ecological Footprint plus the constant (a)] is then multiplied by another, equally arbitrarily chosen constant (β) to normalize the efficiency index. In the Happy Planet Organization formula, the constants have the following numerical values: (α) = 3.35 and (β) = 6.42.

The highest global HPI score is that of Costa Rica (76.1 out of 100). Of the 10 best performing countries of the world, nine are in Latin America.[13] Goldstein (1985) empirically developed the idea that basic human needs indicators – like life expectancy – are a non-linear function of development levels; this has been widely received in the social science literature.[14] The neglect of such a basic non-linear function[15] is a major shortcoming of the currently used Happy Planet Index calculation. The global public health research tradition, too, produced massive evidence on the cross-national determinants of life expectancy and other life quality variables (Wilkinson, 1992; Wilkinson and Picket, 2006; Tausch, 2010). This growing methodological convergence of the social sciences, geography and earth sciences, and public health research on the predictors of life quality at different stages of development should be taken into account in this article (Fain, et al. 1997; Mostafa, 2010a and 2010b; Mostafa and Nataraajan, 2009; Shandra, 2007a, 2007b, Shandra, Leckband, McKinney and London, 2009). We investigated the non-linear trade-offs between ecological footprint and the combined UNDP type indices for six dimensions of development. The results are reported in Table 2.

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[12] http://www.happyplanetindex.org/

[13] http://www.happyplanetindex.org/

[14] See Afxentiou (1990a, 1990b), Anand and Ravillion (1993), Anson (1988, 1991), Cheng (1989), Dixon (1987), Dixon and Moon (1986, 1989), Fosu (2009, 2010a, 2010b, 2010c), Kakwani (1993, 1995), Khan (1991), King (1998), Knight and Rosa,, (2011), Mazumdar (1996, 2000), Moon and Dixon,, (1992), Newman and Thomson (1989), Rudra (2009), and Tausch and Prager (1993).

[15] The most often encountered formulation in the literature is a double logarithmic expression, based on the natural logarithm of development level/energy consumption and its square.

Table 2

The Non-linear Relationship between Happy Life Years and Ecological Footprint, n=140 Countries in 2005.

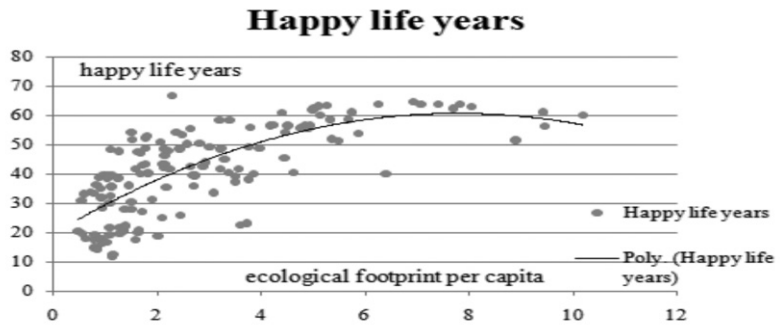
Variable	Coefficient	Std Error
Ecological Footprint per capita	10.541a	1.313
Ecological Footprint per capita^2	-0.677a	0.147
Constant	19.631a	2.246
N =	140	
Adj. R^2 =	0.541	
F-test =	83.081	
p-value =	0.000	

Note: significant at <1%(a), 1-5%(b), 6-10%(c).

Graph 1 depicts the trade-off between ecological footprint and happy life years; the (standardized) residuals in our graph are a reformulated Happy Planet Index:

Graph 1

The Non-linear Relationship between Happy Life Years (HLYE, Vertical) and Ecological Footprint (horizontal), n=140 Countries in 2005.



Appendix Graphs 2a–2h show the trade-off between ecological footprint and smart development, measured for the various dimensions (democracy, economic growth, gender equality, human development, research and development , social cohesion, and the two differently combined overall measurement scales). Only the scatterplot for ecological footprint and social cohesion suggests a weaker relationship; all the other relationships are considerable. The overall development performance, democracy, gender equality, human development, research and development are a clear non-linear, inverted U-shaped function of ecological footprint per capita, while economic growth and also social cohesion first decrease and then increase with rising levels of ecological footprint per capita.

The hitherto existing calculations of the HPI,[16] provided by the Happy Planet Organization, are merely based on simple arithmetical principles. Following Heintz, 1972 we propose as an alternative method a residual method and calculate our smart development indicators as the standardized residuals from Appendix Graph 2. The standardized residual values are computed as observed minus predicted development outcomes divided by the square root of the residual mean square (see Appendix, Table 1 and 2):

$$SDP_i = (HLYE_i - \hat{HLYE}_i) / \hat{\sigma} \quad (2)$$

High positive outliers imply a very high smart development performance, while countries below the trend line are the countries with a low smart development performance. Having established a residual-based smart Development Indicator family, we now can look at the cross-national determinants of smart development performance.

Results on the Drivers and Bottlenecks of Smart Development

The image of social realities suggested upon a first inspection of smart development performance values around the globe would point to a Friedrich August Hayek vision (Hayek, 1945, 1989) of markets, inequality and a free society interacting with one another. There should be no blocks against inequalities in the name of whatever social justice, explaining then the phenomenal success of the unequal Latin American societies on the parameters of smart development (see the global rankings of smart development in Appendix Table 3). At the same time, the high-equality performers in global society (quintile share of less than 5.0) with a relatively high per-capita income are at the same time bad performers on the new smart development scales. Notably enough, several of these countries are members of the European Union and are traditional developed western welfare states. This very first glance at the data would suggest a complete turn-around from the European social model (Tausch and Ghymers, 2006) in favor of a high-inequality, open to globalization 'Latin American model' or a Philippine model as the best way to achieve a good smart development performance. However, such a first glance overlooks the massive available evidence about world economic openness and the failure of smart development.

As to the multivariate analysis, first preliminary stepwise regression procedures with mean substitution of missing variables revealed a re-current pattern of the importance and predictive capability robustness of the chosen variables among the 26 independent variables with a theoretically well-plausible greater and significant effect on the dependent variables (the six component indicators of development and the overall development performance indicators). The final results were achieved by forward multiple regression based on a list-wise deletion of missing values, and based exclusively on the significant predictors from the prior preliminary stepwise regressions. We first present results of our multiple regression analyses in Table 3.

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[16] We refer our readers to the very comprehensive Yale/Columbia environmental data series available at http://sedac.ciesin.columbia.edu/es/esi/ and http://epi.yale.edu/Home . The new 'grammar' of the global footprint discourse can be found at http://www.footprintnetwork.org/en/index.php/GFN/page/glossary/ .

Table 3
The Significant Drivers and Bottlenecks of Smart Development

Independent Variable	**Dependent variable**	**Beta**	**error prob.**
% women in government, all levels (feminist theory, stressing the need to feminize structures of government)	Overall smart development index, based on 26 variables, weighted equally	0.185	0.045
% women in government, all levels (feminist theory, stressing the need to feminize structures of government)	Smart democracy	0.196	0.007
% women in government, all levels (feminist theory, stressing the need to feminize structures of government)	Smart gender justice	0.300	0.001
% world population (Amin's five monopolies of power)	Smart human development	0.152	0.061
% world population (Amin's five monopolies of power)	Happy Life Years	0.161	0.060
% world population (Amin's five monopolies of power)	Smart economic growth	0.261	0.002
2000 Economic Freedom Score (its absence is explained either by Amin's critique of rent-seeking seeking in the periphery or conventional neo-liberal theories of economic growth)	Overall smart development index, based on 26 variables, weighted equally	0.336	0.002
2000 Economic Freedom Score (its absence is explained either by Amin's critique of rent-seeking seeking in the periphery or conventional neo-liberal theories of economic growth)	Overall smart development index, based on 26 variables, weighted equally	0.402	0.000
2000 Economic Freedom Score (its absence is explained either by Amin's critique of rent-seeking seeking in the periphery or conventional neo-liberal theories of economic growth)	Smart democracy	0.457	0.000
Absolute latitude (Andre Gunder Frank's 'Re-Orient' model)	Smart economic growth	-0.234	0.006
Annual population growth rate, 1975-2005 (%) (Paul Israel Singer's dependency theory)	Smart R&D	-0.253	0.007
Annual population growth rate, 1975-2005 (%) (Paul Israel Singer's dependency theory)	Smart social cohesion	-0.248	0.006
Immigration - Share of population 2005 (%) (Amin's theory about the role of migration)	Smart democracy	-0.348	0.000
Military expenditures per GDP (quantitative dependency and peace research approaches)	Happy Life Years	-0.245	0.004
Military expenditures per GDP (quantitative dependency and peace research approaches)	Smart gender justice	-0.204	0.018
Military expenditures per GDP (quantitative dependency and peace research approaches)	Overall smart development index, based on 26 variables, weighted equally	-0.191	0.021
Military expenditures per GDP (quantitative dependency and peace research approaches)	Overall smart development index, based on 26 variables, weighted equally	-0.166	0.074
Military personnel rate ln (quantitative dependency and peace research approaches)	Smart democracy	-0.221	0.002

Table 3 (continued)

Independent Variable	Dependent variable	Beta	error prob.
MNC outward investments (stock) per GDP (Bornschier's dependency theory, stressing the importance of MNC headquarter status in international society)	Smart R&D	0.479	0.000
Muslim population share per total population (Amin's critique of Islamism, implicitly expecting a negative trade-off with development performance versus Andre Gunder Frank's 'Re-Orient' model, expecting a transfer of growth and productive activities to the global East and South)	Smart gender justice	-0.396	0.000
Muslim population share per total population (Amin's critique of Islamism, implicitly expecting a negative trade-off with development performance versus Andre Gunder Frank's 'Re-Orient' model, expecting a transfer of growth and productive activities to the global East and South)	Smart economic growth	0.313	0.000
Openness-Index, 1990 (export-share per GDP + import-share per GDP) (Amin's conception of the role of the peripheries)	Smart R&D	-0.552	0.000
Openness-Index, 1990 (export-share per GDP + import-share per GDP) (Amin's conception of the role of the peripheries)	Overall smart development index, based on 26 variables, weighted equally	-0.222	0.019
Openness-Index, 1990 (export-share per GDP + import-share per GDP) (Amin's conception of the role of the peripheries)	Overall smart development index, based on 26 variables, weighted equally	-0.170	0.048
Population density (José Carlos Mariategui's dependency theory)	Overall smart development index, based on 26 variables, weighted equally	0.214	0.010
Public education expenditure per GNP (human capital approaches in the tradition of the UNDP versus Kalecki/Steindl paradigm versus neo-liberal approaches, featuring a 'crowding out' phenomenon)	Smart social cohesion	-0.270	0.003
Public education expenditure per GNP (human capital approaches in the tradition of the UNDP versus Kalecki/Steindl paradigm versus neo-liberal approaches, featuring a 'crowding out' phenomenon)	Smart human development	-0.196	0.024
Public education expenditure per GNP (human capital approaches in the tradition of the UNDP versus Kalecki/Steindl paradigm versus neo-liberal approaches, featuring a 'crowding out' phenomenon)	Smart R&D	0.235	0.010
UNDP education index (human capital approaches in the tradition of the UNDP versus Kalecki/Steindl paradigm)	Overall smart development index, based on 26 variables, weighted equally	0.198	0.036
UNDP education index (human capital approaches in the tradition of the UNDP versus Kalecki/Steindl paradigm)	Smart human development	0.478	0.000

Table 3 (continued)

Independent Variable	Dependent variable	Beta	error prob.
Worker remittance inflows as % of GDP (conventional center-periphery models about the negative consequences of the brain drain versus new migration theories, underlining the positive effects of worker remittances on migration sending countries)	Smart economic growth	-0.262	0.002
Worker remittance inflows as % of GDP (conventional center-periphery models about the negative consequences of the brain drain versus new migration theories, underlining the positive effects of worker remittances on migration sending countries)	Overall smart development index, based on 26 variables, weighted equally	0.177	0.064
Worker remittance inflows as % of GDP (conventional center-periphery models about the negative consequences of the brain drain versus new migration theories, underlining the positive effects of worker remittances on migration sending countries)	Overall smart development index, based on 26 variables, weighted equally	0.208	0.016
Worker remittance inflows as % of GDP (conventional center-periphery models about the negative consequences of the brain drain versus new migration theories, underlining the positive effects of worker remittances on migration sending countries)	Smart R&D	0.229	0.017
Worker remittance inflows as % of GDP (conventional center-periphery models about the negative consequences of the brain drain versus new migration theories, underlining the positive effects of worker remittances on migration sending countries)	Smart gender justice	0.241	0.007
Worker remittance inflows as % of GDP (conventional center-periphery models about the negative consequences of the brain drain versus new migration theories, underlining the positive effects of worker remittances on migration sending countries)	Happy Life Years	0.288	0.002
Worker remittance inflows as % of GDP (conventional center-periphery models about the negative consequences of the brain drain versus new migration theories, underlining the positive effects of worker remittances on migration sending countries)	Smart human development	0.352	0.000
Years of membership in the EU, 2010 (Amin's theory about the importance of European integration as a counterweight to US dominance in the world system)	Smart democracy	0.183	0.006

The following independent variables wield only good and positive effects on smart development:

- % women in government, all levels (feminist theory; three effects positive; zero effects negative)
- % world population (Amin's five monopolies of power; three effects positive; zero effects negative)
- Economic Freedom Score (Amin's critique of rent-seeking; three effects positive; zero effects negative)

- MNC outward investments (stock) per GDP (Bornschier's dependency theory; one effect positive; zero effects negative)
- population density (José Carlos Mariategui's dependency theory; one effect positive; zero effects negative)
- UNDP education index (Steindl/Kalecki-paradigm; two effects positive; zero effects negative)
- Years of membership in the EU (Amin's theory about the role of integration; one effect positive; zero effects negative)

The following predictors wielded only negative consequences on smart development:

- Absolute latitude (Andre Gunder Frank's *'Re-Orient'* model; zero effects positive; one effect negative)
- Annual population growth rate (%) (Paul Israel Singer's dependency theory; zero effects positive; two effects negative)
- Immigration share of total population (%) (Amin's theory about the role of migration; zero effects positive; one effect negative)
- military expenditures per GDP (dependency and peace research approaches; zero effects positive; four effects negative)
- military personnel rate (dependency and peace research approaches; zero effects positive; one effect negative)
- Openness-Index (export-share per GDP minus import-share per GDP) (Amin's conception of the role of the peripheries; zero effects positive, three effects negative)

The following variables wielded mixed results:

- worker remittance inflows as % of GDP (six effects positive; one effect negative)
- Muslim population shares (one effect positive; one effect negative)
- public education expenditure per GNP (one effect positive; two effects negative)

The following predictors seem to wield an overwhelming power:

- workers remittances (six positive effects);
- feminization of power structure (three positive effects)
- share of world population (three positive effects)
- economic freedom (three positive effects)
- world economic openness index (three negative effects),
- military expenditures (four negative effects).

In the following, we will present the results of our research. Table 4 shows the significant drivers and bottlenecks of Happy Planet performance, i.e. happy life years in relationship to the ecological footprint of a particular society used. The z-standardized residuals from Graph 2 are well-explained; our equation is based on 103 countries with

complete data. It explains 29% of total variance; the F-value for the entire equation is 9.339, and the error probability is 0.000. The constant is -124.628 and is significant. There is a clear Kuznets curve at work (see also Stern, 2004). But the shape of the curve contradicts much of the earlier debate on the subject: with rising per capita incomes, problem solving capacities first increase and then decrease. The larger states in the world system, having a larger share of global population, are much better able to achieve a good happy-life–years' performance at relatively low ecological costs, measured in ecological footprints than smaller nations. This clearly contradicts the small is beautiful philosophy in the tradition of Kohr and Schumacher. Military expenditures are a clear additional burden on an ecologically viable happy planet performance, while those societies dependent on worker remittances clearly manage to perform better on this scale than other societies around the globe.

Table 4

The Drivers and Bottlenecks of Happy Planet Performance

Independent Variable	**B**	**Std error**	**Beta**
Constant	-124.628a	42.647	
% world population	0.596c	0.313	0.161
In GDP per capita	26.062b	10.069	3.136
In GDP per capita ^2	-1.309b	0.584	-2.731
Military expenditures per GDP	-1.098a	0.376	-0.245
Worker remittance inflows as % of GDP	0.420a	0.133	0.288
Statistical properties of the equation	adj R^2	df	F
Note: significant at <1%(a), 1-5%(b), 6-10%(c)	29.000	102	9.339

In a similar fashion, we can establish in Table 5 that in the 101 countries with complete data, smart overall development, as defined in Graph 2a of this work, is explained up to 37% by our model. The F-test for the entire equation is 9.392, the error probability is 0.000. The constant is -2.486 and is significant. The ten countries of the world system best combining the performance on our 26 development indicators and avoiding an ecological footprint at the same time are the Philippines, Sri Lanka, Costa Rica, Sweden, Jamaica, the Dominican Republic, Finland, Peru, the Netherlands, and Trinidad and Tobago. The ten worst performers on this scale are Sudan, Bosnia and Herzegovina, the Central African Republic, the United Arab Emirates, Niger, Kuwait, Chad, Zimbabwe, Burundi, and Hong Kong, China (SAR). Feminism in power, economic freedom, population density, the UNDP education index as well as the receipt of worker remittances, all significantly contribute towards a smart overall development, while high military expenditures and a high world economic openness are bottlenecks for smart overall development.

Table 5
Drivers and Bottlenecks of Smart Overall Development

Independent Variable	B	Std error	Beta
Constant	-2.486a	0.533	
% women in government. all levels	0.025b	0.012	0.185
2000 Economic Freedom Score	0.031a	0.010	0.336
military expenditures per GDP	-0.076b	0.032	-0.191
Openness-Index. 1990 (export-share + import-share per GDP)	-0.004b	0.002	-0.170
Population density	0.002a	0.001	0.214
UNDP education index	0.945b	0.445	0.198
Worker remittance inflows as % of GDP	0.027b	0.011	0.208
Statistical properties of the equation	adj R^2	df	F
Note: significant at <1%(a), 1-5%(b), 6-10%(c)	37.000	100	9.392

Also it emerges that the results about the drivers of overall smart development performance are similar to the ones reported in Table 6, if we calculate the overall development performance by weighting equally its six component indices and only then calculating the overall final country performance score, and not, unlike in Table 5, being based on the sum of the equally weighted 26 original component indices (as to the trade-off with ecological footprint, see Appendix Graph 2b). Economic freedom and received worker remittances per GDP again emerge as the drivers of smart development (Table 6), while the bottlenecks of smart overall development performance are again military expenditures per GDP and world economic openness. This time, the adjusted R^2 is 19%, and the equation is based on 102 countries with complete data. The F-test for the entire equation is 6.908, and the equation is significant at the 0.000-level. The constant is -1.469 and is significant.

Table 6
Drivers and Bottlenecks of Smart Overall Development, Based on an Index which Weighs the Six Dimensions Equally

Independent Variable	B	Std error	Beta
Constant	-1.469a	0.536	
2000 Economic Freedom Score	0.035a	0.008	0.402
Military expenditures per GDP	-0.061c	0.034	-0.166
Openness-Index. 1990 (export-share + import-share per GDP)	-0.005b	0.002	-0.222
Worker remittance inflows as % of GDP	0.021c	0.011	0.177
Statistical properties of the equation	adj R^2	Df	F
Note: significant at <1%(a), 1-5%(b), 6-10%(c)	19.000	101	6.908

Table 7 is an invitation to consider the drivers and bottlenecks of smart democracy (see also Appendix Graph 2c). The ten smartest democracies of our globe are Costa Rica, the Netherlands, Jamaica, Chile, Sweden, India, Benin, Madagascar, Finland, and Germany; these are the countries of the world system that best combine democratic performance and avoid an ecological footprint. The worst performers are Sudan, Belarus, Kazakhstan, Kuwait, the United Arab Emirates, Uzbekistan, Lebanon, Hong Kong, China (SAR), Azerbaijan, and Myanmar. The adjusted R^2 of our equation is 48.6%, and the F-value for the entire equation is 25.743 with the error p for the equation being 0.000. It is based on 132 countries with complete data. The drivers of smart democracy are feminized structures of government, economic freedom, and years of membership in the European Union. The significant bottlenecks of smart democracy are high military personnel ratios and a high share of immigrant population. The constant of our equation is -2.037, and it is significant.

Table 7
Drivers and Bottlenecks of Smart Democracy

Independent Variable	**B**	**Std error**	**Beta**
Constant	-2.037a	0.409	
% women in government. all levels	0.029a	0.011	0.196
2000 Economic Freedom Score	0.041a	0.007	0.457
Military personnel rate ln (MPR+1)	-0.334a	0.105	-0.221
Immigration - Share of population 2005 (%)	-0.031a	0.007	-0.348
Years of membership in the EU. 2010	0.014a	0.005	0.183
Statistical properties of the equation	adj R^2	df	F
Note: significant at <1%(a), 1-5%(b), 6-10%(c)	48.600	131	25.743

Our next Table, Table 8, analyses the drivers and bottlenecks of smart economic growth combining high economic growth with low rates of ecological footprint per capita (see also Appendix Graph 2d). The IMF data for economic growth in 2010 as well as the Happy Planet Organization data on ecological footprint suggest that the 10 best performers were China, Azerbaijan, Botswana, Uzbekistan, Congo (Democratic Republic of the), Bhutan, Sudan, Mongolia, Ethiopia, and Lebanon, while the worst performers with the worst cocktail of slow economic growth in relation to their ecological footprint per capita were Zimbabwe, Moldova, Lithuania, Latvia, Ukraine, Jamaica, Haiti, Armenia, Tajikistan, and Madagascar. Our equation about smart growth is based on 111 countries with complete data; the R^2 is 25.2%, the F-value is 10.243, and the error probability of the entire equation is 0.000. The constant is 0.195, and it is not significant. Population size in relation to the global population as well as Muslim population share per total population are the significant drivers of smart development in the global system today, while absolute latitude (i.e. countries in the far North and South of the world system) as well as nations depending on worker remittances are the bottlenecks of smart growth today. This again suggests the tectonic shifts in the

geographical structures of global growth today, away from the countries of the North Atlantic arena towards the nations of the Indian and Pacific Oceans. Those shifts also thwart the smart growth efforts of the countries exporting their workforce to the hitherto existing centers of the global economy.

Table 8
Drivers and Bottlenecks of Smart Economic Growth (2010)

Independent Variable	**B**	**Std error**	**Beta**
Constant	0.195	0.178	
% world population	0.099a	0.031	0.261
Absolute latitude	-0.013a	0.005	-0.234
Worker remittance inflows as % of GDP	-0.035a	0.011	-0.262
Muslim population share per total population	0.009a	0.002	0.313
Statistical properties of the equation	adj R^2	df	F
Note: significant at <1%(a), 1-5%(b), 6-10%(c)	25.200	110	10.243

Table 9 of our study analyzes the drivers and bottlenecks of smart gender justice. We are comparing the given amount of gender equality in a society with the amount of resources (ecological footprint) needed to sustain it (see Appendix Graph 2e). The global best performers on this equation, that is, those in achieving a maximum of gender justice with a minimum of ecological footprint, are the Philippines, South Africa, Finland, Norway, Mozambique, Sweden, Iceland, Kyrgyzstan, Sri Lanka, and Uganda. The worst balance sheet on this item of combining 'lilac' gender policies and 'green' issues are Yemen, Saudi Arabia, the United Arab Emirates, Turkey, Pakistan, Chad, Iran, Kuwait, Korea (Republic of), and Egypt. Our equation, based on the 93 countries with complete data, explains 39% of total variance, and achieves an F-value of 15.712 with an error probability of the entire equation of 0.000. The insignificant constant has the value of -0.034. Women in government and worker remittances per GDP are the significant drivers of smart gender justice, while high military expenditures and the Muslim population share per total population are the major bottlenecks of smart gender justice.

Table 9
Drivers and Bottlenecks of Smart Gender Justice

Independent Variable	**B**	**Std error**	**Beta**
Constant	-0.034	0.213	
% women in government. all levels	0.044a	0.013	0.300
Military expenditures per GDP	-0.087b	0.036	-0.204
Worker remittance inflows as % of GDP	0.035a	0.013	0.241
Muslim population share per total population	-0.010a	0.003	-0.396
Statistical properties of the equation	adj R^2	df	F
Note: significant at <1%(a), 1-5%(b), 6-10%(c)	39.000	92	15.712

Table 10 looks at the drivers and bottlenecks of smart human development. On this scale the ten countries best combining the task of a maximum of human development with a minimum of ecological footprint per capita (see also Appendix Graph 2f) are Jamaica, the Philippines, Cuba, Sri Lanka, Costa Rica, Vietnam, the Dominican Republic, Indonesia, Colombia, and Moldova; while all the worst performers are located in the African continent: Botswana, Namibia, the Central African Republic, Burkina Faso, Niger, Sierra Leone, Zimbabwe, Mali, Angola, and Chad. Our equation explains 29.9% of the total variance of smart development and is based on the analysis of the 115 countries with complete data; the F-value is 13.183 and the error p of the entire equation is 0.000. The constant, which is weakly significant, has a value of -1.657. The drivers of smart human development are the share of a country's population in world population, indicating the relative size of a nation, the UNDP education index, measuring the levels of education in a given country, and worker remittance inflows as a percent of GDP. The bottleneck of smart human development is constituted by the crowding-out effect of public education expenditures on human development.

Table 10

Drivers and Bottlenecks of Smart Human Development

Independent Variable	**B**	**Std error**	**Beta**
Constant	-1.657a	0.348	
% world population	0.055c	0.029	0.152
Public education expenditure per GNP	-0.097b	0.042	-0.196
UNDP education index	2.437a	0.430	0.478
Worker remittance inflows as % of GDP	0.044a	0.010	0.352
Statistical properties of the equation	adj R^2	df	F
Note: significant at <1%(a), 1-5%(b), 6-10%(c)	29.900	114	13.183

Table 11 analyses the drivers and bottlenecks of smart R&D performance. The equation is based on 93 countries with complete data; the R^2 is 33%, the F-value is 10.058, and the error probability of the entire equation is 0.000. The constant, which is not significant, is 0.326. The drivers of smart R&D performance, combining the R&D record with a minimum of ecological footprint (see also Appendix Graph 2g), are the dominant position of a country on the global markets, expressed in the indicator multinational corporation outward investments per GDP, the public education expenditure, and worker remittance inflows as a percentage of GDP. The significant bottlenecks against a smart R&D performance are population pressure (the annual population growth rate) and world economic openness. According to our indicator, the best performing countries are the United States, Sweden, New Zealand, Finland, Israel, the United Kingdom, the Netherlands, Norway, Switzerland, and Kyrgyzstan. The worst performers are: the United Arab Emirates, Luxembourg, Kuwait, Namibia, Botswana, Cyprus, Bosnia and Herzegovina, Macedonia, Uruguay, and the Czech Republic.

Table 11
Drivers and Bottlenecks of Smart R&D

Independent Variable	**B**	**Std error**	**Beta**
Constant	0.326	0.327	
Annual population growth rate. 1975-2005 (%)	-0.248a	0.089	-0.253
MNC outward investments (stock) per GDP	0.043a	0.009	0.479
Openness-Index. 1990 (export-share + import-share per GDP)	-0.014a	0.002	-0.552
Public education expenditure per GNP	0.136a	0.051	0.235
Worker remittance inflows as % of GDP	0.050b	0.021	0.229
Statistical properties of the equation	adj R^2	df	F
Note: significant at <1%(a), 1-5%(b), 6-10%(c)	33.000	92	10.058

Our last result is presented in Table 12. It features the preconditions of smart social cohesion, combining a relatively high social cohesion with a relatively low ecological footprint (see also Appendix Graph 2h). Our equation is based on an analysis of 120 countries with complete data, the adjusted R^2 is just 8.7%; the F-value is 6.771; and the error probability of the entire equation is 0.002. The constant is 0.824 and is significant. There are two significant bottlenecks and no positive drivers of smart social cohesion – annual population growth (population pressure) and the crowding-out effects of public education expenditures per GDP. The best results on our indicator are achieved by several less developed and/or (former) communist or left wing regime countries as well as nations with a known record of relatively egalitarian development policies (South Korea), with the entire group comprising Chad, Uzbekistan, Rwanda, Belarus, Laos, Cuba, Benin, Tajikistan, Korea (Republic of), and Thailand. The worst records of combing social cohesion with low ecological footprints were found in Djibouti, Namibia, Bosnia and Herzegovina, the Central African Republic, Sierra Leone, Botswana, Macedonia, Bolivia, South Africa, and Colombia.

Table 12
Drivers and Bottlenecks of Smart Social Cohesion

Independent Variable	**B**	**Std error**	**Beta**
Constant	0.824a	0.206	
Annual population growth rate. 1975-2005 (%)	-0.152a	0.055	-0.248
Public education expenditure per GNP	-0.102a	0.034	-0.270
Statistical properties of the equation	adj R^2	df	F
Note: significant at <1%(a), 1-5%(b), 6-10%(c)	8.700	119	6.771

Discussion

Our residuals-based reformulation of smart development realistically captures the trade-off between the global ecological footprint per capita and development performance and offers us a better idea about smart development performance at different stages of socio-economic development. Our results show that traditional indicators of economic globalization and also inequality have little influence on smart development performance, but that hitherto neglected elements of dependency and world systems theory gain in importance. This is especially relevant for the socio-economic theory of Samir Amin, but it is also true of the contributions by feminism, peace research, and by other various approaches in the globalization critical tradition. Efficiency tends to increase and then to decrease with rising development levels. Big countries with large populations perform better on our scales, and military expenditures/personnel rates are a significant block against smart development performance. In a sense, our results also contradict the logic inherent in the 'beautiful', but unfortunately wrong 'small is beautiful' analysis proposed by Schumacher (1973a): It is not the small countries but rather the big countries that find it easier to have a satisfactory smart development performance in comparison to their ecological footprint. Our research also shows the beneficial effects of migration on the sending countries. Worker remittances have a significant positive effect on the HPI and a host of other smart development indicators. Migration sending countries, in accordance with Samir Amin's dependency theory, reap substantial benefits from receiving worker remittances, while other indicators of globalization hardly affect the smart development performance.

Only the following significant effects highlight the necessity to further develop the paradigm, as seen here in the negative, crowding out effects of public education expenditures per GDP on smart social cohesion and smart human development, and in the negative effects of worker remittance inflows as a percentage of GDP wield on smart economic growth. The impressive list of tests, speaking in favor of the globalization critical paradigm as presented in this work, would suggest further development of this research approach to questions of smart development.

First of all, the dependency and world systems paradigm laid out by Samir Amin comes to our mind. As correctly predicted by Samir Amin, the big countries with huge population resources today are favored in their smart economic growth, their Happy Life Years, and their smart human development. As correctly expected by Amin, peripheral rent seeking is a burden and its absence, measured by economic freedom, is an asset among the forces shaping international development today, especially for smart democracy and the overall smart development index. In addition, Amin correctly stresses the necessity for European integration, and the positive effects of years of EU membership on smart democracy confirm Euro-optimism. He correctly analyses the enormous transfer of resources from the center to the periphery, brought about by migration, with the huge statistical observed effects of received worker remittances on smart human development, Happy Life Years, smart gender justice, smart R&D; both formulations of the smart development index justify his assumption. Amin's depen-

dency theory correctly predicts the negative effects of world economic openness on smart development. The obvious huge statistical negative and uniform effects cannot be simply and easily rejected out of hand: smart R&D and overall smart development are affected negatively by world economic openness. Among the major four founding figures of the world systems approach (Amin, Arrighi, Frank and Wallerstein, 1982), he is the only one to have come up, in addition, with a consistent and far-reaching critique of Islamism, confirmed by the negative trade-off between Muslim population share and smart gender empowerment.

But in some ways, Amin's paradigm has to be expanded and refined: Feminism is an important driver of smart gender justice, smart democracy, and the overall smart development index, based on 26 variables, weighted equally. Feminist approaches, in principle, would be well compatible with Amin's original approach. The Kalecki/Steindl paradigm also can be merged with Amin's theory, and it has three significant results in its favor – the positive determination of smart R&D by public education expenditures, the positive effects of the UNDP education index on smart human development and also on overall smart development index, based on 26 variables, weighted equally. Several further strains of dependency/world systems research are confirmed in this essay: Bornschier's dependency theory and the importance it attaches to multinational corporation headquarter status, which is confirmed by the positive effect of this variable on smart R&D; and the effect of population density, predicted in José Carlos Mariategui's dependency theory on the overall smart development index, based on 26 variables, weighted equally. Paul Israel Singer's approach to dependency and population dynamics is confirmed by the significant negative effects of annual population growth rates on smart R&D and smart social cohesion.

The following empirical results could be interpreted as expressions of Andre Gunder Frank's Re-Orient hypothesis (1999) concerning a fundamental shift in the global production dynamics away from the old centers and towards the countries of the Indian and Pacific Oceans. This relates to the significant positive effect of Muslim population share per total population on smart economic growth, and the significant negative effects of absolute latitude on smart economic growth, of immigration - share of population in 2005 on smart democracy (the biggest migration recipients are the countries of the global North), and worker remittance inflows as a percentage of GDP on smart economic growth.

For some other processes, Amin's empirical five monopolies of power include two elements of military might, the monopoly of technology, supported by military expenditures of the dominant nations, and the monopoly of the military means of mass destruction. However, the significant negative effects of military expenditures (on Happy Life Years, smart gender justice, the two formulations of the overall smart development index) or military personnel rates (smart democracy) on smart development support the arguments of quantitative peace research during the last decades with its warnings against high military spending rates (Auvinen and Nafziger, 1999; Heo, 1998; Mintz and Stevenson, 1995).

As we stated, the real differences with the theories presented here are to be found in the negative effects of public education expenditures per GDP on smart social cohesion and smart human development. In this case, our response can only be to draw the attention of the global research community to the essays published by Blankenau and Simpson (2004) and Sylwester (2000), written from the perspective of established economic theory. Blankenau and Simpson (2004) investigate the public education expenditure-growth relationship in the context of an endogenous growth model in which private and public investment contribute to the discussion on human capital accumulation. They could show that the positive direct effect of public education spending on growth can be diminished or even negated when other determinants of growth are negatively affected by general equilibrium adjustments. Blankenau and Simpson showed that the response of growth to public education expenditures may be non-monotonic. The relationship depends on the level of government spending, the tax structure and the parameters of production technologies. Sylwester (2000), for his part, could demonstrate that although public education expenditures are positively associated with future economic growth, the contemporaneous effect upon growth is negative.

Conclusions

Since all existing major comparative empirical studies on drivers and bottlenecks of environmental quality only touched upon different dependent variables, and not on the smart development, this first international comparative study suggests cautiously that future research efforts in comparative environmental science would be well advised to take the major predictor variables of the present study into account as well as the environmental plateau curve (see also Weede and Kampf, 2002; de Haan, Lundstrom and Sturm, 2006; and Gwartney, Lawson and Holcombe, 1999).

It emerges that the absence of rent seeking, economic freedom and a free price mechanism, and worker remittances are the most important drivers of smart development. Most of the small is beautiful assumptions of Schumacherian economics by contrast do not stand the test of cross-national development accounting and are squarely contradicted by our empirical results; with population density and population size always being among the drivers, and not the bottlenecks of smart development.

As correctly predicted by Samir Amin, the big countries with huge population resources today are favored in their smart economic growth, their Happy Life Years, and their smart human development. As correctly expected by Amin, peripheral rent seeking is a burden and its absence, measured by economic freedom, is an asset among the forces shaping international development today, especially for smart democracy, and the overall smart development index. In addition, Amin correctly stressed the necessity for European integration, and the positive effects of years of EU membership on smart democracy confirm Euro-optimism. He correctly analyzed the enormous transfer of resources from the center to the periphery, brought about by migration, with the huge statistical observed effects of received worker remittances on smart human development, Happy Life Years, smart gender justice, smart R&D, and both formulations of the smart

development index. Amin's dependency theory correctly predicted the very negative effects of world economic openness on smart development. The huge statistical negative and very uniform effects, to be observed, cannot be simply and easily rejected out of hand: smart R&D and overall smart development are affected negatively by world economic openness. Among the major four founding figures of the world systems approach (Amin, Arrighi, Frank and Wallerstein, 1982), he is the only one to have come up, in addition, with a consistent and far-reaching critique of Islamism, confirmed by the very negative trade-off between Muslim population share and smart gender empowerment.

We show in this article the importance of Feminism, the Kalecki/Steindl paradigm, the multinational corporation headquarter status, population density, population dynamics, Muslim population share per total population, absolute latitude, and migration on smart development. We also investigated the negative effects of public education expenditures per GDP on smart development.

We are aware that our answers to the questions in this article are incomplete. But we hope to have provided at least some preliminary guiding posts for further research on this important subject.

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Appendix

Appendix Table 1a

The Dependent Variables and Other Control Variables used in a Number of High-profile Studies in Economics.

29	Component UNDP-type index for overall democracy-performance
30	Component UNDP-type index for overall economic growth-performance
31	Component UNDP-type index for overall gender-performance
32	Component UNDP-type index for overall human development-performance
33	Component UNDP-type index for overall R&D-performance
34	component UNDP-type index for overall social cohesion-performance
35	% women in government, all levels
36	% world population
37	2000 Economic Freedom Score
38	Absolute latitude

Table 1a (continued)

39	Annual population growth rate, 1975-2005 (%)
40	Comparative price levels (US=1.00)
41	Foreign savings rate
42	FPZ (free production zones) employment as % of total population
43	Ln GDP per capita
44	Ln GDP per capita ^2
45	Membership in the Islamic Conference (now: Cooperation)
46	Military expenditures per GDP
47	Military personnel rate ln (MPR+1)
48	MNC outward investments (stock) per GDP
49	MNC PEN - stock of Inward FDI per GDP
50	MNC PEN: DYN MNC PEN 1995-2005
51	Openness-Index, 1990 (export-share per GDP + import-share per GDP)
52	Population density
53	Public education expenditure per GNP
54	UNDP education index
55	Worker remittance inflows as % of GDP
56	Immigration - Share of population 2005 (%)
57	Muslim population share per total population
58	Net international migration rate, 2005-2010
59	Years of membership in the EU, 2010
60	Years of membership in EMU, 2010
61	Social security expenditure per GDP average 1990s (ILO)
62	Ecological footprint (g ha /cap)
63	Ecological footprint (g ha /cap)^2

Appendix Table 1b

The Independent Variables of our Model and their Links to Earlier Empirical Studies

Independent variables, determinants of smart development	**Theories or earlier empirical studies, connected with these variables**
% women in government, all levels	Holmberg, Rothstein and Nasiritousi, 2009; Logo, 2008; Matt, 2010; McDowell, 1992; Orloff, 1996; Rankin, 2002; Rothstein and Teorell; UNDP, HDR, 1995
% world population	Acemoğlu and Dell, 2010; Acemoğlu and Robinson, 2000, 2001, 2006; Acemoğlu, 2003, 2005, 2010a, 2010b; Acemoğlu, Johnson and Robinson, 2001, 2002, 2005; Amin, 1997a, 1997b; Crenshaw and Robison, 2010; Kohr, 1957, 1958, 1960, 1977, 1992; Ram, 1997; Schumacher, 1973a, 1973b, 1976, 1977

Table 1b (continued)

Independent variables, determinants of smart development	**Theories or earlier empirical studies, connected with these variables**
2000 Economic Freedom Score	Alesina and Perotti, 1994; Helliwell, 1994; La Porta, Lopez de Silanes, Shleifer, 1999; York, Rosa and Dietz, 2003
Absolute latitude	Acemoğlu and Dell, 2010; Acemoğlu and Robinson, 2000, 2001, 2006; Acemoğlu, 2003, 2005, 2010a, 2010b; Acemoğlu, Johnson and Robinson, 2001, 2002, 2005; Easterly, 2000; Poe and Tate, 1994; Ram 1997
Annual population growth rate, 1975-2005 (%)	Acemoğlu and Dell, 2010; Acemoğlu and Robinson, 2000, 2001, 2006; Acemoğlu, 2003, 2005, 2010a, 2010b; Acemoğlu, Johnson and Robinson, 2001, 2002, 2005; Crenshaw and Robison, 2010; Ram, 1997
Comparative price levels (US=1.00)	Egert, Drine and Lommatzsch, 2003; Faria and Leon-Ledesma, 2003; Gould, 2002; Kohler and Tausch, 2003; Paya, Venetis and Peel, 2003; Raffer, 1987; Tausch and Ghymers, 2006; Yotopoulos and Sawada, 2005; Yotopoulos, 1996
Foreign savings rate	Bovenberg and van Ewijk, 1997; Cook, 1995; Doucouliagos and Paldam, 2008; Easterly and Schmidthebbel, 1993; Feldstein, 1994; Gine and Townsend, 2004; Singh, 1985; Tausch and Ghymers, 2006; Tausch and Prager, 1993; Taylor, 1992
FPZ (free production zones) employment as % of total population	Chen, 1995; Rondinelli, 1987; Tausch and Ghymers, 2006; Tausch and Prager, 1993
Immigration - Share of population 2005 (%)	Barro and Sala-i-Martin, 2003; Dixon and Moon, 1986, 1989; Dixon, 1987; Durlauf *et al.,* 2008; Fain, 1997; Fosu, 2009, 2010a, 2010b, 2010c; Moon and Dixon, 1992; Shandra et al., 2009; Shandra, 2007a, 2007b; Tausch and Prager, 1993
ln GDP per capita	Afxentiou, 1990a, 1990b; Anand and Ravillion, 1993; Anson, 1988, 1991; Barro, 2000; Cheng, 1989; Dixon and Moon, 1986, 1989; Dixon, 1987; Fosu, 2009, 2010a, 2010b, 2010c; Kakwani, 1993, 1995; Khan, 1991; King, 1998; Knight and Rosa, 2011; Mazumdar, 1996, 2000; Moon and Dixon, 1992; Newman and Thomson, 1989; Rudra, 2009; Selden and Song, 1994; Stern, 2004; Stern, Common and Barboer, 1996; Tausch and Prager, 1993
ln GDP per capita ^2	Afxentiou, 1990a, 1990b; Anand and Ravillion, 1993; Anson, 1988, 1991; Barro, 2000; Cheng, 1989; Dixon and Moon, 1986, 1989; Dixon, 1987; Fosu, 2009, 2010a, 2010b, 2010c; Kakwani, 1993, 1995; Khan, 1991; King, 1998; Knight and Rosa, 2011; Mazumdar, 1996, 2000; Moon and Dixon, 1992; Newman and Thomson, 1989; Rudra, 2009; Selden and Song, 1994; Stern, 2004; Stern, Common and Barboer, 1996; Tausch and Prager, 1993
Membership in the Organization of Islamic Cooperation (OIC)	de Soysa and Ragnhild, 2007; Haynes, 2001
Military expenditures per GDP	Auvinen and Nafziger, 1999; Biswas and Ram, 1986; Brzoska and Lock, 1992; Brzoska and Ohlson, 1986, 1987; Brzoska and Pearson, 1994; Heo, 1998; Mintz and Stevenson, 1995
Military personnel rate ln (MPR+1)	Auvinen and Nafziger, 1999; Heo, 1998; Keller, Poutvaara, and Wagener, 2010; Mintz and Stevenson, 1995; Weede and Jagodzinski, 1980; Weede and Tiefenbach, 1980a, 1980b, 1981; Weede, 1980, 1981a, 1981b, 1983, 1985, 1986, 1993

Table 1b (continued)

Independent variables, determinants of smart development	**Theories or earlier empirical studies, connected with these variables**
MNC outward investments (stock) per GDP	Beer, 1999; Bornschier, 1982, 2002; Dick and Jorgenson, 2010; Dutt, 1997; Heshmati, 2006b; Jorgenson and Burns, 2007; Jorgenson, 2003, 2004a, 2004b, 2005, 2006a, 2006b, 2007a, 2007b, 2008, 2009a, 2009b; Jorgenson, and Burns, 2004; Jorgenson, Dick, and Mahutga, 2007; Jorgenson, Kuykendall, and Kennon 2008; Kentor, 1998; Klitgaard and Fedderke, 1995; Lawrence, 2009; Longo and York, 2008; Mostafa and Nataraajan, 2009; Mostafa, 2010a, 2010b; Nugent, and Shandra, 2009; Shandra, 2007a, 2007b; Shandra, and London, 2008; Shandra, Leckband, and London, 2009; Shandra, Leckband, McKinney, and London 2009; Shandra, London, Whooley, and Williamson, 2004; Shandra, Shor, and London, 2008, 2009; Tausch and Prager, 1993; Tausch, 2003; Tsai 1995
MNC PEN - stock of Inward FDI per GDP	Beer, 1999; Bornschier, 1982, 2002; Dick and Jorgenson, 2010; Dutt, 1997; Heshmati, 2006b; Jorgenson and Burns, 2007; Jorgenson, 2003, 2004a, 2004b, 2005, 2006a, 2006b, 2007a, 2007b, 2008, 2009a, 2009b; Jorgenson, and Burns, 2004; Jorgenson, Dick, and Mahutga, 2007; Jorgenson, Kuykendall, and Kennon 2008; Kentor, 1998; Klitgaard and Fedderke, 1995; Lawrence, 2009; Longo and York, 2008; Mostafa and Nataraajan, 2009; Mostafa, 2010a, 2010b; Nugent, and Shandra, 2009; Shandra, 2007a, 2007b; Shandra, and London, 2008; Shandra, Leckband, and London, 2009; Shandra, Leckband, McKinney, and London 2009; Shandra, London, Whooley, and Williamson, 2004; Shandra, Shor, and London, 2008, 2009; Tausch and Prager, 1993; Tausch, 2003; Tsai 1995
MNC PEN: DYN MNC PEN 1995-2005	Beer, 1999; Bornschier, 1982, 2002; Dick and Jorgenson, 2010; Dutt, 1997; Heshmati, 2006b; Jorgenson and Burns, 2007; Jorgenson, 2003, 2004a, 2004b, 2005, 2006a, 2006b, 2007a, 2007b, 2008, 2009a, 2009b; Jorgenson, and Burns, 2004; Jorgenson, Dick, and Mahutga, 2007; Jorgenson, Kuykendall, and Kennon 2008; Kentor, 1998; Klitgaard and Fedderke, 1995; Lawrence, 2009; Longo and York, 2008; Mostafa and Nataraajan, 2009; Mostafa, 2010a, 2010b; Nugent, and Shandra, 2009; Shandra, 2007a, 2007b; Shandra, and London, 2008; Shandra, Leckband, and London, 2009; Shandra, Leckband, McKinney, and London 2009; Shandra, London, Whooley, and Williamson, 2004; Shandra, Shor, and London, 2008, 2009; Tausch and Prager, 1993; Tausch, 2003; Tsai 1995
Muslim population share per total population	Acemoğlu and Dell, 2010; Acemoğlu and Robinson, 2000, 2001, 2006; Acemoğlu, 2003, 2005, 2010a, 2010b; Acemoğlu, Johnson and Robinson, 2001, 2002, 2005; Ram, 1997
Net international migration rate, 2005-2010	Ehrhardt-Martinez, Crenshaw and Jenkins, 2002
Openness-Index, 1990 (export-share per GDP + import-share per GDP)	Alesina, Spolaore and Wacziarg, 2000; Dollar, 1992a, 1992b; Edwards, 1993; Frankel and Romer, 1999; Rodrik, 2006; Rodrik, Subramanian, and Trebbi, 2004; World Bank, 2005
Population density	Acemoğlu and Dell, 2010; Acemğglu and Robinson, 2000, 2001, 2006; Acemoğlu, 2003, 2005, 2010a, 2010b; Acemoğlu, Johnson and Robinson, 2001, 2002, 2005; Ram, 1997
Public education expenditure per GNP	Blankenau and Simpson, 2004; Glomm and Ravikumar, 1997; Ram, 1986; Scanlan, 2004; Sylwester, 2000; Weede and Kampf, 2002

Table 1b (continued)

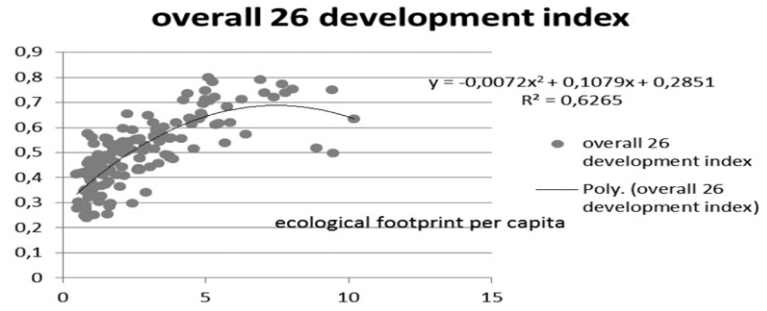
Independent variables, determinants of smart development	**Theories or earlier empirical studies, connected with these variables**
UNDP education index	Blankenau and Simpson, 2004; Glomm and Ravikumar, 1997; Sylwester, 2000; Weede and Kampf, 2002
Worker remittance inflows as % of GDP	Acosta, Calderon, Fajnzylber, et al., 2008; Amuedo-Dorantes and Pozo, 2004; Martin and Straubhaar, 2002
Years of membership in EMU, 2010	Allsopp and Artis, 2003; Buti, Franco and Ongena, 1998; de la Porte, Pochet and Room, 2001; Egert, Drine and Lommatzsch, 2003; Molle and Boeckhout, 1995
Years of membership in the EU, 2010	Allsopp and Artis, 2003; Buti, Franco and Ongena, 1998; de la Porte, Pochet and Room, 2001; Egert, Drine and Lommatzsch, 2003; Molle and Boeckhout, 1995

Appendix Graph 2

Ecological footprint and general development performance – the non-linear tradeoffs

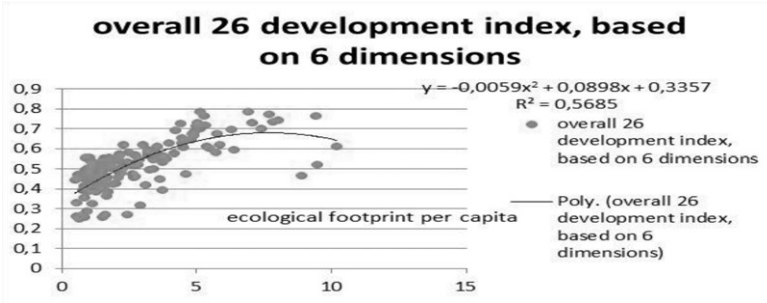
Graph 2a

Ecological Footprint and the General Development Performance Index, Based on an Equal Weighting of its 26 Components



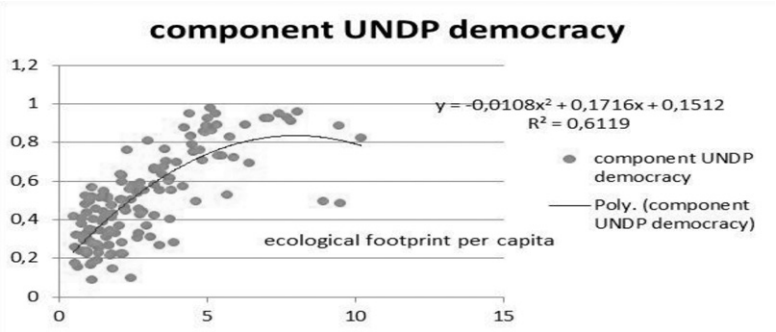
Graph 2b

Ecological Footprint and the General Development Performance Index, based on an Equal Weighting of the Six Dimensions, Underlying the 26 Components



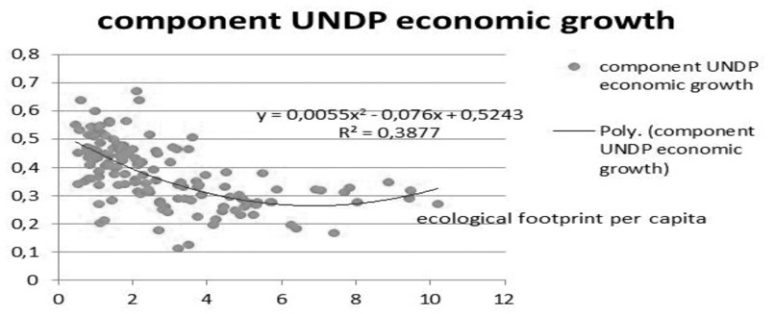
Graph 2c

Ecological Footprint and Democratic Performance (6 components combined)



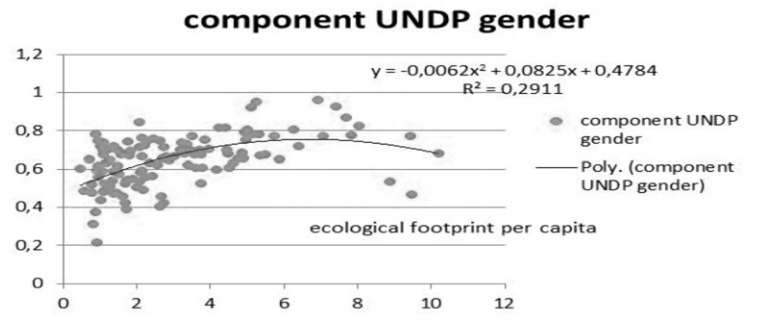
Graph 2d

Ecological Footprint and Economic Growth Performance (4 components combined)



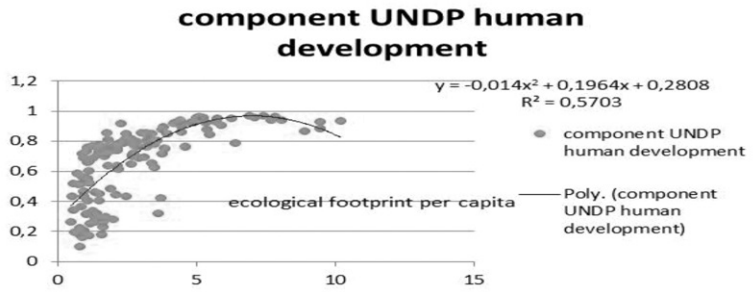
Graph 2e

Ecological Footprint and Gender Equality Performance (6 components combined)



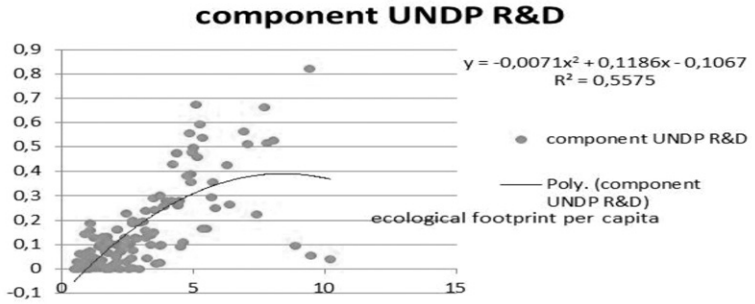
Graph 2f

Ecological Footprint and Human Development Performance (5 components combined)



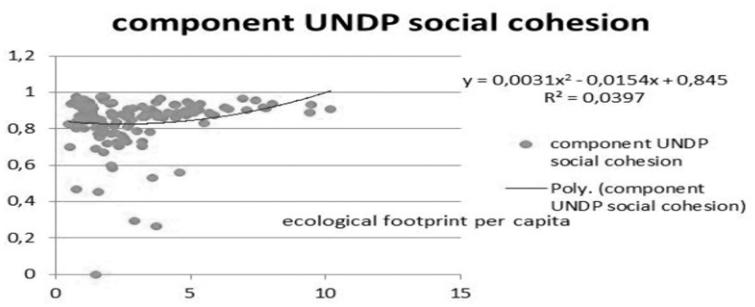
Graph 2g

Ecological Footprint and Research and Development Performance (3 components combined)



Graph 2h

Ecological Footprint and Docial Cohesion Performance (2 components combined)



Appendix Table 2

Global Smart Development, Residual Component, Sorted by Overall Development Index Based on Six Dimensions

Country	Overall 26 development index	Overall 26 development index, based on six dimensions	UNDP democracy	UNDP economic growth	UNDP gender	UNDP human development	UNDP R&D	UNDP social cohesion
Sudan	-2.512	-3.117	-2.788	1.650		-1.516	-0.941	
Bosnia and Herzegovina	-2.381	-2.858	-1.304	-1.251		-0.270	-1.536	-3.805
Kuwait	-1.887	-2.552	-2.290	0.693	-1.717	-0.328	-2.514	
Djibouti	-0.705	-2.500	0.185	0.478		-0.853	-0.437	-5.940
Namibia	-1.185	-2.428	-0.260	0.362	-0.013	-2.457	-1.797	-4.061
Central African Republic	-2.214	-2.410	-0.565	-0.190		-2.382	-0.480	-2.692
Macedonia	-1.396	-1.853	-1.499	0.047	-0.839	-0.760	-1.529	-2.020
Togo	-0.979	-1.830	0.075	-1.201		-0.423	0.255	
Congo (Democratic Republic of the)	-0.850	-1.756	-0.657	1.822		-1.249	0.315	
Lebanon	-1.299	-1.731	-1.842	1.470		-0.339	0.015	
United Arab Emirates	-1.970	-1.725	-2.260	0.211	-2.158	-0.003	-2.816	-0.310
Botswana	-1.075	-1.684	0.524	2.091	-0.787	-3.052	-1.789	-2.127
Sierra Leone	-1.400	-1.617	0.271	0.007		-2.032	0.241	-2.645
Angola	-0.669	-1.543	-0.511	0.053	0.423	-1.811	0.057	
Congo	-0.481	-1.488	0.125	-0.376		-0.242	0.380	
Zimbabwe	-1.750	-1.264	-1.035	-2.819	-0.314	-1.956	-0.004	0.268
Niger	-1.888	-1.257	-0.500	0.306		-2.104	-0.537	-0.029
Chad	-1.827	-1.084	-1.350	0.144	-1.876	-1.749	-0.614	1.071
Estonia	-1.303	-0.972	-0.788	-0.956	-0.319	-1.091	-0.850	0.258
Turkey	-1.134	-0.946	-0.744	-0.902	-2.091	0.100	-0.729	-0.004
Iran	-1.021	-0.934	-1.376	1.002	-1.785	-0.012	-1.341	-0.111
Hong Kong, China (SAR)	-1.528	-0.921	-1.728	0.077		-0.106	-0.400	0.236
Kazakhstan	-1.327	-0.882	-2.334	0.008	0.365	-0.797	-0.614	0.384
Paraguay	-0.519	-0.849	-1.164	0.016	0.195	-0.014	-1.339	-0.894
Burkina Faso	-1.312	-0.817	-0.556	0.784	-1.033	-2.120	-0.850	0.800
Mauritania	-0.643	-0.758	-0.737	0.513	-0.557	-0.733	-0.663	-0.782

Table 2 (continued)

Country	Overall 26 development index	Overall 26 development index, based on six dimensions	UNDP democracy	UNDP economic growth	UNDP gender	UNDP human development	UNDP R&D	UNDP social cohesion
Saudi Arabia	-1.064	-0.701	-1.522	-0.096	-2.211	0.718	-0.443	0.271
Cameroon	-1.097	-0.699	-1.098	-0.343	-0.571	-1.220	-0.095	0.221
Russia	-1.324	-0.681	-1.631	-1.070	-0.230	-0.645	0.546	0.399
Haiti	-0.765	-0.632	-0.423	-1.672		0.349	0.388	-0.970
Burundi	-1.598	-0.624	-0.360	-0.660		-1.480	0.142	0.738
Nigeria	-1.092	-0.610	-0.907	-0.198	-0.341	-1.463	-0.181	0.430
Uruguay	-0.508	-0.591	-0.227	1.197	-0.628	-0.574	-1.420	-0.176
Mali	-0.687	-0.559	0.751	0.724	-1.239	-1.889	-0.508	-0.127
Guinea	-1.292	-0.557	-0.553	0.120		-1.047	-0.243	0.603
Belarus	-1.445	-0.537	-2.546	-0.141	0.419	-0.489	0.097	0.960
Greece	-0.612	-0.494	-0.430	0.604	-0.904	-0.273	-0.834	0.113
Syria	-0.427	-0.494	-1.629	0.454	-0.790	0.798	-0.705	-0.384
Czech Republic	-0.564	-0.485	-0.195	0.019	-0.643	-0.337	-1.381	0.602
Malta	-0.404	-0.401	-0.643	0.267	-0.868	0.470	-1.227	0.234
Singapore	-0.643	-0.401	-0.722	-1.257	-1.033	0.386	0.131	0.399
Luxembourg	-0.010	-0.394	0.308	-0.634	0.016	0.713	-2.801	-0.709
Yemen	-0.705	-0.356	-0.401	0.943	-2.996	0.145	0.038	0.020
Mexico	-0.288	-0.297	-0.358	-0.468	-0.564	0.407	-0.983	0.322
Korea (Republic of)	-0.390	-0.293	-0.157	0.164	-1.589	0.376	-1.217	0.833
Azerbaijan	-0.923	-0.260	-1.699	2.893	-1.237	-0.152	-0.129	-0.057
Venezuela	-0.302	-0.240	-0.720	-1.194	0.023	0.484	-0.349	0.155
Ukraine	-0.571	-0.213	-0.542	-2.114	-0.004	0.043	0.314	0.579
Bolivia	0.200	-0.201	0.273	0.332	-0.293	0.037	0.431	-1.748
Ethiopia	-0.626	-0.198	-0.120	1.498	-0.950	-1.593	-0.297	0.701
Cyprus	-0.122	-0.191	0.314	1.022	-1.037	0.214	-1.654	0.345
Egypt	-0.294	-0.158	-0.946	0.463	-1.556	1.053	-0.609	0.174
Mongolia	-0.051	-0.150	0.373	1.579	0.022	-1.043	-0.594	-0.337
Myanmar	-0.799	-0.150	-1.636	1.165		0.274	0.305	0.228
Rwanda	-1.105	-0.129	-0.270	0.548		-1.277	0.202	1.012
Zambia	-0.226	-0.110	0.731	-0.100	-0.162	-1.545	0.254	-0.228
Algeria	-0.151	-0.098	-0.941	0.245	-0.643	0.840	-0.028	-0.461

Table 2 (continued)

Country	Overall 26 development index	Overall 26 development index, based on six dimensions	UNDP democracy	UNDP economic growth	UNDP gender	UNDP human development	UNDP R&D	UNDP social cohesion
Albania	0.172	-0.074	-0.216	0.404	-0.661	0.870	-0.465	-0.724
Belize	0.466	-0.052	0.301	0.296	-0.222	0.732	-1.286	-0.543
Guyana	0.372	-0.033	0.100	1.092	0.854	-0.297	-0.967	-0.707
South Africa	0.682	-0.013	1.216	-0.472	2.001	-1.156	-0.086	-1.625
Kenya	-0.287	-0.009	-0.220	-0.158	0.245	-0.966	0.006	0.473
Romania	-0.091	0.009	0.012	-1.035	-0.143	0.274	-0.436	0.607
Croatia	0.105	0.050	-0.057	-0.553	0.128	0.480	-0.614	0.279
Ecuador	0.597	0.055	-0.065	-0.886	0.833	0.874	-1.027	-0.363
Latvia	-0.218	0.069	0.132	-2.330	0.740	-0.094	0.585	0.464
Brazil	0.547	0.076	0.432	-0.351	-0.061	0.783	-0.342	-0.860
Portugal	0.183	0.135	0.926	-0.428	-0.197	-0.088	-0.175	0.162
Pakistan	-0.224	0.146	0.154	-0.359	-2.079	0.567	0.118	0.669
Italy	-0.010	0.183	0.262	-0.481	-0.658	0.173	0.714	0.392
Uganda	-0.127	0.204	-0.740	1.444	1.261	-1.262	-0.261	0.598
Malaysia	0.099	0.205	0.031	-0.596	-0.679	0.853	-0.088	0.365
Laos	-0.435	0.209	-1.066	0.788		0.519	-0.091	0.939
Armenia	0.034	0.216	0.095	-1.643	-0.964	1.129	0.362	0.253
Lithuania	0.059	0.224	0.564	-2.577	0.517	0.229	0.343	0.670
Slovakia	0.332	0.226	0.432	0.161	-0.037	0.312	-0.587	0.247
Spain	0.204	0.240	0.323	0.058	0.226	0.029	0.130	0.143
Iceland	0.389	0.248	0.837	-1.138	1.598	0.024	-1.379	0.392
Uzbekistan	0.046	0.310	-1.931	1.830	0.796	0.315	-0.727	1.055
Tanzania	0.222	0.311	0.508	0.890	0.606	-1.455	-0.153	0.592
Colombia	0.880	0.347	0.058	-0.755	0.612	1.404	0.198	-1.137
Poland	0.233	0.349	0.255	0.733	-0.040	0.058	0.236	0.191
Benin	0.010	0.351	1.383	-0.079	-1.054	-0.921	0.081	0.896
Ireland	0.417	0.381	0.618	-0.794	0.489	-0.044	0.564	0.333
Japan	0.104	0.384	0.889	-0.609	-0.705	0.193	0.462	0.744
Panama	0.765	0.396	0.492	1.456	0.194	0.555	-0.346	-0.720
Cambodia	0.228	0.398	0.045	-0.337	0.067	-0.117	0.109	0.752
Slovenia	0.174	0.410	0.606	0.430	-0.392	0.138	-0.018	0.671
Hungary	0.280	0.410	0.986	-0.467	-0.172	0.015	0.137	0.575

Table 2 (continued)

Country	Overall 26 development index	Overall 26 development index, based on six dimensions	UNDP democracy	UNDP economic growth	UNDP gender	UNDP human development	UNDP R&D	UNDP social cohesion
Bulgaria	0.375	0.422	0.376	-0.981	0.498	0.398	0.201	0.397
Jordan	0.232	0.425	-0.467	0.519	-0.558	1.033	0.474	-0.023
Ghana	0.559	0.437	1.006	0.865	0.285	-0.560	-0.342	0.033
Guatemala	0.694	0.471	0.392	-0.538	-0.123	1.204	-0.154	-0.171
Tunisia	0.584	0.497	-0.027	0.798	-0.555	1.143	0.156	-0.249
Israel	0.218	0.528	-0.155	0.204	-0.416	0.135	2.179	0.211
Senegal	0.476	0.537	1.064	0.113	0.099	-0.378	-0.219	0.581
Honduras	0.847	0.577	0.376	-0.359	0.604	0.866	-0.128	-0.040
Madagascar	0.638	0.595	1.378	-1.269	1.024	-0.445	-0.038	0.412
Georgia	0.433	0.602	0.207	-0.708	-0.702	1.162	1.240	-0.226
Nicaragua	0.728	0.611	0.338	-0.396	0.850	0.756	-0.471	0.433
China	0.438	0.626	-1.255	3.239	-0.380	0.893	-0.093	0.391
Morocco	0.581	0.632	0.119	0.450	-0.688	1.164	0.238	0.093
Nepal	0.689	0.649	0.922	-0.174	-0.539	0.583	0.344	0.026
France	0.650	0.662	0.812	0.060	0.492	0.132	0.711	0.271
El Salvador	1.137	0.681	0.834	-0.908	0.751	1.180	0.108	-0.531
Canada	0.610	0.682	0.682	0.632	0.179	-0.066	1.140	0.109
Australia	0.598	0.698	0.542	0.689	0.276	0.025	1.080	0.013
Belgium	0.692	0.730	0.793	-0.063	0.369	0.119	1.217	0.293
Mozambique	0.591	0.737	0.934	0.580	1.791	-1.545	0.032	0.732
Argentina	0.998	0.764	0.509	-0.684	1.020	1.084	0.743	-0.462
Denmark	0.792	0.821	0.865	0.059	0.736	-0.085	1.162	0.135
Malawi	0.932	0.848	1.309	0.696	0.773	-0.646	0.448	-0.080
Chile	1.240	0.866	1.678	0.826	-0.038	0.697	0.062	-0.295
Bhutan	0.608	0.879	0.295	1.677		0.619	-0.037	0.710
Thailand	0.732	0.879	0.894	-0.825	0.348	0.670	0.406	0.831
United Kingdom	0.777	0.881	0.918	-0.120	0.361	-0.017	1.832	0.364
Trinidad and Tobago	1.385	0.943	1.122	0.241	1.232	0.750	-0.729	0.304
Austria	0.835	0.982	1.041	0.053	0.151	0.242	1.441	0.669
Tajikistan	0.749	0.988	-0.185	-1.399	1.076	1.110	0.769	0.839
Cuba	0.940	0.990	-1.333	0.374	1.230	1.707	0.256	0.910

Table 2 (continued)

Country	Overall 26 development index	Overall 26 development index, based on six dimensions	UNDP democracy	UNDP economic growth	UNDP gender	UNDP human development	UNDP R&D	UNDP social cohesion
Germany	1.164	1.009	1.357	-0.981	0.883	0.385	1.387	0.338
Dominican Republic	1.560	1.014	1.149	-0.228	1.015	1.488	0.429	-1.009
Moldova	1.020	1.030	0.781	-2.607	1.223	1.211	0.843	0.630
Kyrgyzstan	0.639	1.058	-0.330	-0.930	1.586	0.789	1.482	0.436
Bangladesh	0.867	1.076	0.518	0.562	-0.344	0.846	0.598	0.711
India	0.976	1.082	1.581	0.962	-1.535	0.754	0.501	0.635
Indonesia	1.047	1.102	0.183	-0.154	0.594	1.480	0.569	0.293
Peru	1.426	1.135	0.885	0.713	0.756	1.105	0.595	-0.383
Vietnam	0.931	1.137	-0.595	0.853	0.678	1.650	0.100	0.830
Switzerland	1.236	1.156	1.309	-0.241	0.636	0.288	1.606	0.595
New Zealand	1.037	1.158	0.681	0.509	1.070	-0.114	2.343	0.052
United States	1.069	1.294	0.516	-0.123	0.583	0.281	3.722	-0.595
Norway	1.264	1.356	0.706	0.658	1.884	0.001	1.613	0.570
Netherlands	1.409	1.369	1.748	-0.627	0.837	0.439	1.688	0.680
Costa Rica	1.949	1.377	1.930	-0.075	1.024	1.670	-0.460	0.084
Jamaica	1.687	1.401	1.703	-2.057	1.210	1.780	0.516	0.191
Finland	1.544	1.509	1.364	-0.531	1.911	0.196	2.312	0.433
Sri Lanka	2.083	1.709	1.261	0.095	1.474	1.699	0.127	0.549
Sweden	1.817	1.838	1.616	-0.120	1.656	0.273	3.077	0.519
Philippines	2.452	1.871	1.324	-1.188	2.119	1.745	1.295	0.239

Appendix Table 3

Rankings: Global Smart Development
(Members of the European Union are printed in bold letters)

Country	26 development index	26 development index, based on six dimensions	Democracy	Economic growth	Gender	Human development	R&D	Social cohesion
Philippines	1	1	11	126	1	2	13	69

Table 3 (continued)

Country	26 development index	26 development index, based on six dimensions	Democracy	Economic growth	Gender	Human development	R&D	Social cohesion
Sri Lanka	2	3	14	63	9	4	60	37
Costa Rica	3	6	1	76	18	5	101	85
Sweden	**4**	**2**	**5**	**81**	**6**	**61**	**2**	**38**
Jamaica	5	5	3	135	14	1	30	75
Dominican Republic	6	19	16	89	20	7	36	123
Finland	**7**	**4**	**9**	**103**	**3**	**65**	**4**	**42**
Peru	8	13	28	29	28	18	25	108
Netherlands	**9**	**7**	**2**	**108**	**24**	**48**	**7**	**20**
Trinidad and Tobago	10	24	17	55	11	34	116	59
Norway	11	8	37	33	4	81	8	36
Chile	12	28	4	23	66	38	67	104
Switzerland	13	11	12	90	33	57	9	31
Germany	**14**	**20**	**10**	**122**	**21**	**52**	**12**	**56**
El Salvador	15	36	31	118	29	12	63	112
United States	16	9	46	82	38	58	1	114
Indonesia	17	14	68	84	37	8	27	61
New Zealand	18	10	39	41	16	92	3	86
Moldova	19	18	34	139	13	10	19	26
Argentina	20	31	47	111	19	19	21	111
India	21	15	6	18	112	33	31	25
Cuba	22	21	124	48	12	3	46	6
Malawi	23	29	13	30	27	109	34	96
Vietnam	24	12	106	22	32	6	64	11
Colombia	25	60	76	113	34	9	54	124
Bangladesh	26	16	45	37	80	27	24	17
Honduras	27	44	53	95	36	25	83	94
Austria	**28**	**23**	**19**	**69**	**56**	**62**	**11**	**23**
Denmark	**29**	**30**	**29**	**66**	**31**	**88**	**16**	**81**
United Kingdom	**30**	**25**	**25**	**80**	**47**	**85**	**6**	**54**
Panama	31	55	49	11	54	43	95	117

Table 3 (continued)

Country	26 development index	26 development index, based on six dimensions	Democracy	Economic growth	Gender	Human development	R&D	Social cohesion
Tajikistan	32	22	86	132	15	17	20	8
Thailand	33	26	26	115	48	39	37	10
Nicaragua	34	41	56	97	23	32	103	43
Guatemala	35	48	52	104	69	11	86	99
Belgium	**36**	**33**	**33**	**75**	**45**	**72**	**15**	**60**
Nepal	37	38	24	86	84	41	41	88
South Africa	38	80	15	101	2	119	78	125
France	**39**	**37**	**32**	**65**	**41**	**71**	**23**	**63**
Kyrgyzstan	40	17	93	119	8	30	10	41
Madagascar	41	43	8	131	17	104	77	45
Canada	42	35	38	34	55	87	17	83
Bhutan	43	27	61	6	xx	40	76	18
Australia	44	34	43	32	50	78	18	90
Ecuador	45	76	82	116	25	23	124	107
Mozambique	46	32	22	36	5	128	70	16
Tunisia	47	47	80	24	85	15	55	103
Morocco	48	39	72	45	96	13	50	84
Ghana	49	49	20	21	49	106	94	87
Brazil	50	74	50	93	68	31	93	120
Senegal	51	45	18	62	58	102	89	33
Belize	52	82	60	52	74	35	127	113
China	53	40	122	1	81	22	81	51
Georgia	54	42	66	112	97	14	14	101
Ireland	**55**	**57**	**40**	**114**	**42**	**86**	**28**	**57**
Iceland	56	63	30	125	7	79	130	49
Bulgaria	**57**	**51**	**54**	**121**	**40**	**50**	**53**	**48**
Guyana	58	81	73	15	22	98	122	115
Slovakia	**59**	**65**	**51**	**59**	**65**	**56**	**107**	**68**
Hungary	**60**	**52**	**21**	**99**	**72**	**80**	**57**	**35**
Poland	**61**	**59**	**65**	**27**	**67**	**74**	**51**	**76**
Jordan	62	50	99	39	87	21	32	92

Table 3 (continued)

Country	26 development index	26 development index, based on six dimensions	Democracy	Economic growth	Gender	Human development	R&D	Social cohesion
Cambodia	63	54	77	91	59	93	62	13
Tanzania	64	61	48	20	35	124	85	32
Israel	65	46	84	57	83	70	5	74
Spain	**66**	**64**	**57**	**67**	**52**	**77**	**59**	**80**
Bolivia	67	92	62	50	76	76	35	126
Portugal	**68**	**73**	**23**	**98**	**73**	**89**	**87**	**78**
Slovenia	**69**	**53**	**41**	**46**	**82**	**69**	**74**	**21**
Albania	70	83	88	47	94	24	102	118
Croatia	71	77	81	105	57	46	110	62
Japan	72	56	27	107	98	66	33	14
Malaysia	73	69	78	106	95	26	79	53
Lithuania	**74**	**66**	**42**	**138**	**39**	**63**	**42**	**22**
Uzbekistan	75	62	135	4	26	55	115	2
Armenia	76	67	74	133	105	16	40	67
Benin	77	58	7	77	109	114	66	7
Italy	**78**	**71**	**64**	**102**	**93**	**67**	**22**	**50**
Luxembourg	**79**	**99**	**59**	**109**	**62**	**37**	**139**	**116**
Mongolia	80	88	55	8	61	116	108	106
Romania	**81**	**78**	**79**	**123**	**70**	**59**	**98**	**27**
Cyprus	82	90	58	16	108	64	135	55
Uganda	83	70	112	12	10	122	91	30
Algeria	84	84	116	54	92	28	75	110
Latvia	**85**	**75**	**70**	**137**	**30**	**90**	**26**	**40**
Pakistan	86	72	69	94	118	42	61	24
Zambia	87	85	36	79	71	129	48	102
Kenya	88	79	89	85	51	115	72	39
Mexico	89	97	94	100	88	49	123	58
Egypt	90	89	117	43	113	20	109	77
Venezuela	91	94	109	127	60	45	96	79
Korea (Republic of)	92	96	85	58	114	53	125	9
Malta	**93**	**101**	**107**	**53**	**102**	**47**	**126**	**71**

Table 3 (continued)

Country	26 development index	26 development index, based on six dimensions	Democracy	Economic growth	Gender	Human development	R&D	Social cohesion
Syria	94	103	129	44	100	29	114	109
Laos	95	68	119	25	xx	44	80	5
Congo	96	126	71	96	xx	95	39	Xx
Uruguay	97	108	90	13	90	107	132	100
Paraguay	98	117	121	72	53	84	128	121
Czech Republic	**99**	**102**	**87**	**71**	**91**	**100**	**131**	**29**
Ukraine	100	93	102	136	63	75	44	34
Greece	**101**	**104**	**98**	**35**	**103**	**97**	**118**	**82**
Ethiopia	102	91	83	9	104	130	92	19
Singapore	103	100	110	130	107	51	58	47
Mauritania	104	115	111	40	86	110	113	119
Angola	105	127	101	68	43	132	68	Xx
Mali	106	107	35	28	111	133	105	98
Djibouti	107	137	67	42	xx	113	99	133
Yemen	108	98	96	19	122	68	69	89
Haiti	109	111	97	134	xx	54	38	122
Myanmar	110	87	131	14	xx	60	45	72
Congo (Democratic Republic of the)	111	132	108	5	xx	121	43	Xx
Azerbaijan	112	95	132	2	110	94	84	95
Togo	113	133	75	128	xx	103	47	Xx
Iran	114	120	126	17	116	83	129	97
Saudi Arabia	115	114	128	78	121	36	100	64
Botswana	116	129	44	3	99	140	136	128
Nigeria	117	109	115	88	79	125	88	44
Cameroon	118	113	120	92	89	120	82	73
Rwanda	119	86	92	38	xx	123	52	3
Turkey	120	121	113	117	119	73	117	91
Namibia	121	136	91	49	64	139	137	132
Guinea	122	106	103	61	xx	117	90	28
Lebanon	123	131	134	10	xx	101	71	Xx

Table 3 (continued)

Country	26 development index	26 development index, based on six dimensions	Democracy	Economic growth	Gender	Human development	R&D	Social cohesion
Estonia	**124**	**122**	**114**	**120**	**78**	**118**	**119**	**66**
Burkina Faso	125	116	104	26	106	137	120	12
Russia	126	112	130	124	75	108	29	46
Kazakhstan	127	118	138	73	46	112	111	52
Macedonia	128	134	127	70	101	111	133	127
Sierra Leone	129	128	63	74	xx	135	49	129
Belarus	130	105	139	83	44	105	65	4
Hong Kong, China (SAR)	131	119	133	64	xx	91	97	70
Burundi	132	110	95	110	xx	126	56	15
Zimbabwe	133	125	118	140	77	134	73	65
Chad	134	123	125	60	117	131	112	1
Kuwait	135	138	137	31	115	99	138	Xx
Niger	136	124	100	51	xx	136	106	93
United Arab Emirates	137	130	136	56	120	82	140	105
Central African Republic,	138	135	105	87	xx	138	104	130
Bosnia and Herzegovina	139	139	123	129	xx	96	134	131
Sudan	140	140	140	7	xx	127	121	Xx