The Misty Grail: The Search for a Comprehensive Measure of Development and the Reasons of GDP Primacy

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ABSTRACT

The last decades have seen a flourishing of new indicators to measure economic progress, but none of them has succeded in replacing GDP. Why? The article reviews what are arguably the three most successful alternatives to GDP (the Human Development Index, the Genuine Progress Indicator, and the Happy Planet Index), by focusing on their conceptual foundations (the capability approach, utilitarism, the wealth approach, or a mix of these) – rather than on statistical solidity or mathematical refinement as most of the literature does. After discussing their faults, it is shown that the wealth approach underlying GDP can be easily extended to include environmental and well-being components (non-market wealth measured at market prices), and to substantiate this claim estimates of environment-augmented GDP for 130 countries are presented and discussed. However, up to the present not even this line of research has been successful. This suggests that among the reasons behind GDP primacy there is not only philosophical consistency or statistical soundness, but also social suitability, being the standard GDP more suitable to reflect the goals of capitalist-market economies. Constructing composite indicators alternative to GDP is trivial, until when the current preference system has not been changed. To achieve this change, a dashboard approach may be preferable to composite indicators, since the former provides the different social groups with intelligible quantitative instruments.

Keywords: GDP, human development, sustainability, composite indicators, wealth
JEL Classification: B40; E01; I00; O10; Q50

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1. INTRODUCTION

To this day, the literature about GDP and its limits has grown huge, with some resonance also with policy-making (Stiglitz, Sen and Fitoussi, 2009). Many alternative measures have been proposed and, although some of them – namely the Human Development Index (HDI), but also the Genuine Progress Indicator (GPI) and the Happy Planet Index (HPI) – have attained renown, at the present none has succeeded in replacing the long-standing primacy of GDP per capita. While it is widely acknowledged that GDP fails to properly track crucial dimensions of development, from environmental to social goals, there is acceptance that, at least, for GDP the choice of components series and their aggregation function are constrained by a consistent economic theory. This is not the case for alternative composite indicators, which not by chance have even been dubbed, by their critics, «mashup indices» (Ravallion, 2012a). But the advocates of composite indicators have not been discouraged by disapproval; on the contrary, they have gone on with developing a highly refined body of computational techniques, including pre-computation multivariate and post-computation sensitive analyses, in order to make multi-criteria evaluation flexible enough to adapt to different social environments and policy goals.[1] And yet the big questions still loom. What is the use of highly elaborate composite indicators for policy-makers and for the society? Does their increasing complexity go to the detriment of their clarity? If this is the case, should we consider the search for a comprehensive measure of development – an indicator which would be, at the same time, more inclusive than GDP, theoretically consistent, and comparable across periods and countries – as a sort of «misty» grail, i.e. as an unattainable goal which in the end confounds the researcher? And as a consequence, wouldn't the alternative dashboard (of multiple indices) approach, which monitors each component separately, be preferable?[2]

In order to properly address these questions, two important steps have not been taken yet. First, we should understand why thus far the most popular alternative composite indices have failed to replace GDP; second, from the previous mistakes we should draw lessons on how to replace or even only to improve GDP. But in doing so, we should remind that the advantages of composite indicators versus simple ones (and versus a dashboard approach) should not be considered only in abstract terms, but primarily with reference to the social actors who from them derive policy guidance: to

[1] A useful introduction can bee OECD/JCR (2008) and Munda (2012). See also: Munda and Nardo (2009) for mathematical modelling; Munda (2004) for the importance of the social, political and technical structuring process in the computation scheme and the argument of context-dependant weights, which should be intended as importance coefficients and not as trade-off; Munda (2005) for the development of a multi-criterion framework to measure sustainability.

[2] A similar cas is mad by Ravallion (2011) with reference to poverty monitoring.

believe that economics is an abstract science, whose postulates and results can be superimposed upon the actual structure of a given society, is only illusory.

The article aims to contribute to both these open issues. Its starting point is that the failure of the main alternative indices is due, by first instance, to the weakness of their conceptual foundations. All of these indices are composite indicators which weight up different "dimensions" according to some criterion: as we are going to see, the aggregation function and/or the single dimensions are either faulty (Genuine Progress Indicator, Happy Planet Index), or incoherent with the declared goals of the index (Human Development Index). Up to the present, most of the criticisms have concentrated on the statistical consistency and calibration of the indices, or on the accuracy and value of their single dimensions, whereas their conceptual foundations have been relatively overlooked.[3] The result was that some of the new "improved" indices proposed, although mathematically increasingly more refined, were even less conceptually consistent, with paradoxical consequences in terms of policy indications (Ravallion, 2012b). On this, the case of HDI is emblematic, as I will briefly illustrate in paragraph §2; although less popular, GPI and HPI share the same flaws (§3).

The conceptual foundations of GDP are essentially the "wealth" or "income" approach, where wealth is intended in a very strict sense (monetary wealth). The alternative indices are based either on the capabilities approach (the HDI), or on a sort of unclear (and highly subjective) combination of utilitarian and wealth theories (GPI, HPI). I argue that, among those proposed, the wealth approach is the best capable of being converted into an index, i.e. of measuring development: wealth – or its periodical flow, income – is an "objective" quantity with can be measured with a reasonable degree of accuracy, unlike capabilities or utilities. I also argue that it can be extended to include non-market components reflecting well-being and environment, following a literature dating back to the 1970s and 1980s. Thus, it would be possible to have indices of economic progress conceptually consistent and, at the same time, more inclusive than GDP. However, up to the present neither these alternatives have been successful. These considerations suggest that philosophical consistency is only an apparent reason behind GDP enduring primacy, and probably not even the most important one. The higher "social suitability" of GDP could be at least as important: we should not forget that to maximize monetary wealth (via producing good and services to be sold in the market) is the prevailing goal of the current capitalist-market economies (e.g. Hamilton, 2003). Therefore, even though the wealth approach can be extended to include some social and ecological dimensions, without losing the basics of its "objectivity" (§4), it is unlikely that some improved GDP or GDP will succeed, until when the prevailing goals of a society will not be modified to include dimensions which are not currently exchanged in the market. Meantime, the society is a complex living fabric,

[3] In OECD/JCR (2008) out of 158 pages only one (p. 22) is dedicated to warn against possible inconsistencies in the theoretical framework. Less concise is the discussion in Ravallion (2012a, pp. 6–8).

an open field where different actors struggle to affirm their views and interests: in a confrontation like this, a dashboard approach, which endows each social group with its own evaluation instruments, has advantages over composite indicators, where preferences and thus trade-offs are hidden and ultimately confused, and confusion for what concerns policy goals tends to follow from their weak conceptual foundations.

2. FROM CAPABILITIES TO THE HUMAN DEVELOPMENT INDEX. A BRIEF REVIEW OF A FAILURE

The Human Development Index (HDI) was introduced in 1990 by the United Nations Development Program (UNDP, 1990), in its first annual Human Development Report (HDR): through the years, HDI gained vast popularity, so much so that it is now the most established alternative to GDP. Its conceptual foundation must be found in the Sen's capabilities approach to welfare economics (Sen, 1985). Functional capabilities are substantive freedoms people have reason to value: for instance, the ability to live a long and healthy life, «longevity»; the ability to decide about one own future, assured by an adequate «education»; the ability to engage in economic transactions and to satisfy material needs, «resources». Accordingly, poverty must be understood as capability-deprivation. Thus illiteracy, ill health, lack of access to resources, must be considered as obstacles to what an individual can do in her/his life: human development consists in removing these obstacles (Sen and Anand, 1990).

Initially, Sen was sceptical about the idea and the possibility of synthesizing the complexity of the human capabilities approach into one single index. Nonetheless, Pakistani economist Mahbub ul Haq, in Sen's words "the originator of the Human Development Report", succeeded in persuading him that a single indicator was necessary as a means to policy makers alternative to GDP: it would shift the attention of policy makers, and hopefully of the larger public opinion, from maximizing income to maximizing welfare, i.e. from national income accounting to people-centred policies.[4] In other words, HDI was devised for practical purpose: although it got some success as an alternative to GDP, as mentioned, it failed as an instrument for policy makers, as we are going to see. Through the years, further refinements drifted it further away from the original capability approach.

The three basic components of human life were recognized to be longevity, education, and resources. Consistently with the capability approach, these were computed in terms of deprivation, according to the formula:

[4] In Sen's words: "Indeed, I must admit I did not initially see much merit in the HDI itself, which, as it happens, I was privileged to help devise. At first I had expressed to Mahbub ul Haq […] considerable scepticism about trying to focus on a crude index of this kind, attempting to catch in one simple number a complex reality about human development and deprivation". Sen also refers Mahbub's reply: "We need a measure […] of the same level of vulgarity as GNP – just one number – but a measure that is not as blind to social aspects of human life as GNP is" (UNDP, 1999, p. 23, also for the quotation about Mahbub ul Haq; see also Haq, 1995).

$$(1)\ I_{ij} = \frac{\left(\max_j X_{ij} - X_{ij}\right)}{\left(\max_j X_{ij} - \min_j X_{ij}\right)};$$

where I_{ij} is the deprivation indicator for the jth country with respect to the ith variable. The three basic variables were Life expectancy (X_1) for longevity, adult literacy rate (X_2) for education, and the ln of real per capita GDP (X_3) for resources, whereas maximum and minimum values were determined from the actual values of the current sample.[5] The average deprivation indicator was thus determined as the arithmetic mean of the three deprivation indicators:

$$(2)\ I_j = \frac{\sum_{i=1}^{3} I_{ij}}{3};$$

from which HDI was 1 minus the average deprivation index:

$$(3)\ \left(HDI\right)_j = \left(1 - I_j\right)$$

(UNDP, 1990, p. 109). This measure was straightforward, but appealing. The only serious arbitrariness was the use of a log transformation for resources: it was derived from the reasonable premise of diminishing returns from income to human development, and calculated following the well-known Atkinson formulation for the utility of income (Atkinson, 1979), in the presence of diminishing returns (UNDP, 1992, p. 91).

As early as with the second HDR, however, the formula for the education (knowledge) component had changed into an average of two-thirds literacy and one-third mean years of schooling (UNDP, 1991, pp. 88-89). Now, both the weights and the new indicator (mean years of schooling) looked somehow arbitrary. For what concerns mean years of schooling, it was unclear why every year of schooling was counted equal, in each country and also between countries (regardless of cross-country differences in school systems), and, above all, why for each year of schooling and each country the same relationship was supposed to be between years of schooling and the capability of deciding about one own future (i.e., why quantitative differences in the years of schooling, above the literacy threshold, should proxy the capability of deciding about one own future). Up to the present, these questions are still unanswered.

[5] In 1990: 78.4 and 41.8 for life expectancy; 100.0 and 12.3 for adult literacy rate; 3.68 and 2.34 for real GDP per capita (log).

The next step was to move from empirical to theoretical thresholds, which from 1994 onwards were somehow arbitrarily decided for life expectancy (85.0 and 25.0 years), income (PPP $40,000 and $200), and mean years of schooling (15 and 0 years); only adult literacy was left unchanged, ranging from 0% to 100% (UNDP, 1994, p. 108). Then, by 1995, mean years of schooling (a stock measure just like adult literacy ratio) were substituted by combined primary, secondary and tertiary enrolment ratios (a flow measure), ranging from 0% to 100% (UNDP, 1995, p. 134). This was one more step away from the capability approach, which further increased the arbitrariness of the education component, not least because enrolment ratios are flow measures referring to only a part of the population (unlike literacy and mean years of schooling, which are stock measures referring to the whole population). What is worse, in the 1995 HDR there is no justification at all for this change.

Together with great interest,[6] since its introduction HDI also received widespread criticisms, from McGillivray (1991) onwards. Broadly speaking, these criticisms can be catalogued into three categories, not necessarily mutually exclusive: a) those who rejected some or all of the components of the HDI (and the related conceptual framework) and, in some cases, proposed new and alternative indices, such as the Genuine Progress Indicator (Cobb and Cobb Jr., 1994) and similar; b) those who accepted the basic components of the HDI and its conceptual foundations, but added new dimensions, such as political freedom, inequality, pollution; c) those who concentrated on the way the three components were measured and computed. In just a handful of years, the bibliography grew considerably, so much so that we must limit ourselves to the most relevant contributions. While point a) will be developed in the next paragraph, we now focus on the criticisms falling under points b) and c).

For what concerns point b), further developments have considerably extended the number of basic capabilities, with the decisive contribution by Amartya Sen and Sudhir Anand – on sustainability and environment (Sen and Anand 1994a, 1994b), gender equality (Sen and Anand, 1995), human poverty (Sen and Anand, 1997), human rights (Sen and Anand, 2000) – as well as by Martha Nussbaum (2000), who has raised the number of basic capabilities up to ten dimensions.[7] As a consequence, over the years the HDRs have been enriching by incorporating new indicators, such as those on gender equality or human poverty (for a synthesis, see Fukuda-Parr, 2003, p. 303). However, these indicators were computed and discussed as qualifications to the HDI, whose basic composition was not changed, at least in the HDRs. As a consequence, a sort of hierarchies among human capabilities was created which, once again, had no theoretical foundations: why were some capabilities (longevity, knowledge, resources) computed in a synthetic index, with trade-off implica-

[6] For example, among economic historians: see Crafts (1997, 2002) for cross-country comparisons, and Felice and Vasta (2012) for (Italian) regional ones.

[7] These are: 1) life, 2) bodily health, 3) bodily integrity, 4) sense, imagination, and thought, 5) emotion, 6) practical reason, 7) affiliation, 8) other species, 9) play, 10) control over one's environment (Nussbaum, 2000).

tions to the policy maker, while others were treated separately? Up to the present, also this question remains unanswered in the HDRs. On the other hand, many authors have proposed new indices incorporating new or different capabilities: the literature grew as a forest around a tree, and yet still without incorporating the total range of capabilities as developed by Nussbaum, and often with remarkably fragile theoretical and mathematical foundations. The factory of (redundant) composite indicators has been running into high gear, with alleged but indeed more and more feeble links with the capability approach.

Concerning point c), different "improved" HDI have been proposed, aiming to overcome some shortcomings of the previous formulas. Following Kakwani (1993), Leandro Prados (2010) has recently presented an «improved» HDI, along with historical estimates for the world and its main regions covering the period spanning the late XIX century until our days. The main novelties are the use of a convex achievement function for the social components (longevity and education), which assigns higher values (higher achievement) to improvement at the higher levels, and the use of a geometric average, rather than an arithmetic one, in order to reduce substitutability among the index components (i.e., the index performs better when all the three components perform better, and a decrease in one component is hardly compensated by an increase in another).[8] However, not all agreed with these changes, quite the contrary. For example, some authors (Tsui, 1996) have challenged the assumption of a convex achievement function (and thus of increasing returns) for the social components; others (Noorbakhsh, 1998) have even proposed to extend to education the assumption of diminishing returns.

Although at the present the literature is inconclusive, in their latest human development report (UNDP, 2010) the United Nations have accepted some of the above criticisms and made a considerable effort to improve their measure. The three HDI components are now measured as follows:

$$(4)\quad new\left(1-I_{ij}\right)=\frac{\left(X_{ij}-\min_{j} X_{ij}\right)}{\left(\max_{j} X_{ij}-\min_{j} X_{ij}\right)}.$$

For longevity (X_1), which is still measured through the Life expectancy index (LeI), the minimum threshold is theoretical (20 years), while the maximum (83.2) is empirical (the maximum value observed in the sample, Japan in 2010). Education (X_2) is measured through an Education in-

[8] In Prados' words: "The final outcome is a new human development index which, by not concealing the gap between rich and poor countries, casts a much less optimistic view than the one provided by conventional UNDP index while satisfying the HDR concern for international differences" (Prados, 2010, p. 842). The author also introduced some minor changes in the maximum and minimum thresholds, because in his wide historical and geographical range of observations the UNDP maximum and minimum represented cases above the highest and below the lowest, respectively: thus, for life expectancy the minimum was lowered to 24 years.

dex (EI), which is an equal-weighted geometric average of the Mean years of schooling index (MYSI), measured as the mean years of schooling divided by 13.2 (the maximum value observed in the sample, United States in 2000; the minimum equals zero), and the Expected years of schooling index (EYSI), measured as the expected years of schooling divided by 20.6 (the maximum value observed in the sample, Australia in 2002; the minimum equals zero); EI is then proportioned on a maximum of 0.951, the maximum value of the combined Education index observed in the sample (new Zealand in 2010), and a minimum of 0. For resources (X_3), measured through the Income index (II), (ln of) Gross national income, expressed in 2008 US$ PPP, is used instead of (ln of) Gross Domestic Product, (ln of) 108,211 and (ln of) 163 being respectively the maximum (United Arab Emirates in 1980) and minimum (Zimbabwe in 2008) values observed in the sample.[9] The three components are then weighted through a geometric mean, according to the formula:

$$(5)\ \left(new\ HDI\right)_j = \sqrt[3]{\prod_{i=1}^{3} new\left(1 - I_{ij}\right)}.$$ [10]

To sum up, the three main innovations are: a) the use of a geometric mean to weight the three components, which reduces substitutability among them and was common also to the improved HDI; b) the return to empirical (rather than theoretical) thresholds; c) a remarkable refinement of the Education indicator, together with some refinement of the Income indicator.[11]

At a first glance, the new index represents a considerable advance upon the old one. At a first glance. A more in-depth analyses reveals remarkable inconsistencies with both the capability approach and the proposed goals of economic policy. First, for what concerns the education indicator, the last refinement is indeed a further step away from a measure consistent with the capability approach: literacy was, after all, the only indicator easily understandable in terms of capabilities, and it is now abandoned. But the major inconsistency is probably another one. As efficaciously pointed out by Ravallion, after the introduction of the geometric mean, tradeoffs between the single components have become troubling, at least. In Ravallion's words:

[9] GDP looks indeed more appropriate, since it captures the income from national citizens living abroad, namely the remittances from emigrants, while excluding the income produced within the country which goes to foreign citizens.

[10] In the 2010 UNDR, the new HDI is estimated for benchmark years from 1980 up to 2010. The report also presents an inequality adjusted Human development index (IHDI), which is in turn a geometric mean of geometric means – each one computed by discounting each dimension's average value according to its level of inequality, based on a distribution-sensitive class of composite indices.

[11] Out of the possible innovations, the proposal of using a convex function rather than the linear transformation for the non-income components was not received, since it was considered inconsistent with the capability approach: for example, at a late age a further increase in life expectancy should not result into a more than proportionally greater capability of living a long and healthy life. Indeed, in the case of income, following Anand and Sen (2000), it was reasserted that the concave form of the transformation function was more in line with the capability approach.

> Longevity in poor countries has been substantially devalued, though it seems unlikely that this was intended. The HDI's valuation of longevity in the poorest country is now a mere 0.006% of its value in the richest country – a far greater difference than in their average incomes (for which the poorest country has 0.2% of the national income per capita of the richest). A poor country experiencing falling life expectancy due to (say) a collapse in its already weak healthcare system could still see its HDI improve with even a small rate of economic growth. By contrast, the valuations of extra schooling have risen for most countries and they seem high – some four times higher than the valuations typically placed by the labor market on extra schooling. (Ravallion, 2012b, p. 208).

Ravallion holds that these troubling tradeoffs could be largely avoided by using some alternative specifications of Chakravarty's "generalized old HDI" formula, together with replacing Ln GDP with GDP in the Income index and with using the arithmetic mean for the two schooling variables. In more detail, given the formula from Chakravarty (2003):

(6) $HDI^c = [f(LeI) + f(EI) + f(II)] / 3$

Ravallion proposes two special cases of $f(I_x) = I_x^r$, for $(0 < r < 1)$ (the old HDI is the limiting case when r = 1, with perfect substitutability), when r = 0.5 and 0.25. These coefficients maintain some imperfect substitutability and have inter-component tradeoffs more in line with the declared goal of the index. It goes without saying, however, that these coefficients too are somehow arbitrary and so are the tradeoffs. Furthermore, Ravallion himself does not provide any guide to sort between the virtually unlimited possible values of *r*, although he shows some preference for a 0.5 value.[12]

As mentioned, the HDI had been introduced to give policy makers "one simple number" through which to devise and assess more people-centred policies. After more than two decades of debates and refinements, the result was either a number which would favour *less* people-centered policies (the new HDI) or an unlimited amount of alternatives, i.e. too many numbers which, of course, mean no number at all.

[12] Limitedly to the trade-offs between GDP per capita and life expectancy, there is indeed a literature dating back to the 1970s, which follows the utilitarian approach. Namely Usher (1973, 1980) has proposed to assign to life expectancy a weight inversely proportional to a parameter, β, which is assumed to be the elasticity of annual utility with respect to consumption; however, there is no consensus about the value of β, which could range from 0.25 to 0.45 (Usher, 1973; Williamson, 1984; Costa and Steckel, 1997), and of course these changes in the parameter β can have a significant impact on the final index (for a recent example, based on the Italian case, see Brandolini and Vecchi, 2013). More recently, Jones and Klenow (2010) have proposed a money metric of social welfare based on expected utilities, which adjusts consumption per person, at purchasing-power parity, to allow for differences in longevity, leisure and inequality; this method too requires the specification ex-ante of an utility function, being consistent with the utilitarian approach and thus subject to the same criticisms: inevitable arbitrariness in trying to assign objective values (and weights) to subjective preferences.

3. MIXED FOUNDATIONS: THE GENUINE PROGRESS INDICATOR AND THE HAPPY PLANET INDEX

Measures of economic performance alternative to both GDP and HDI can be subject to criticisms similar to those raised against HDI, after allowing for the different theoretical approaches. Being impossible to review all of the indices recently proposed, whose number is growing almost day by day, we are going to concentrate on the most popular two, the Genuine progress indicator (GPI) – a "green" GDP – and the Happy planet index (HPI). These are the only two which gained some success at the institutional level, as testified by the adoption by Chinese and Indian government of the "green" GDP accounting system (e.g. Financial Express Bureau, 2009), or by the support expressed by the UK conservative leader Cameron in favour of HPI (Parker, 2007).

Unlike GDP, GPI is a measure of economic growth which aims to distinguish between good and bad growth. Its foundations date back to a seminal work of Daly and Coby (1989) and are similar to those of the Index of Sustainable Economic Welfare (ISEW) and of other "green" GDP accounting systems. "While methodologies are somewhat different – as synthesized in the GPI 2006 report – the ISEW, GPI, and other green GDP accounting systems all involve three basic steps". The starting point are estimates of personal consumption expenditures, "which are weighted by an index of the inequality in the distribution of income to reflect the social costs of inequality and diminishing returns to income received by the wealthy" (Talberth, Cobb, and Slattery, 2007, p. 3). The second step consists of a number of additions, "made to account for the non-market benefits associated with volunteer time, housework, parenting, and other socially productive time uses as well as services from both household capital and public infrastructure." The third step consists of deductions, "to account for purely defensive expenditures such as pollution related costs or the costs of automobile accidents as well as costs that reflect the undesirable side effects of economic progress". Other kind of deductions, "for costs associated with degradation and depletion of natural capital incurred by existing and future generations are also made at this stage (ibid, p. 3; see also Stockhammer *et al.*, 1997; Neumayer, 2000). In more detail, the GPI is derived from 25 indicators, according to the formula:

(7) GPI = PC / (GI × 100) + VHP + VHE + VVW + SCD + SH − CCr − LLT − CUn – CCD – CCom – CHPA – CAA – CWP – CAP – CNP – LWL – LFL – LPF – RD – CDED – COD +/− NCI +/− NFB;

where PC is personal consumption; GI, Gini Index; VHP, value of housework and parenting; VHE, value of higher education; VVW, value of volunteer work; SCD, services of consumer durables; SH, services of highways; CCr, cost of crime; LLT, loss of leisure time; CUn, cost of underemployment; Ccom, cost of commuting; CHPA, cost of household pollution abatement; CAA, cost of auto accidents; CWP, cost of water pollution; CAP, cost of air pollution; CNP, cost of noise pollution; LWL, loss of wetlands; LFL, loss of farmland; LPF, loss of primary forests; RD, resource depletion; CDED, carbon dioxide emission damage; COD, cost of ozone depletion; NCI, net capital investment; NFB, net foreign borrowing (Talberth, Cobb, and Slattery, 2007, pp. 8-18).

Although not devoid of foundations in both economic theory and the principles of sustainable development, unsurprisingly such a measure too has raised severe criticisms, concerning either its theoretical foundations, calculation methods, and the choice of components (for an overview, see ibid, p. 7). Over the years, successive refinements have coped with some computational problems, but the result is still far from answering to what is probably the main objection, concerning the arbitrariness of what GPI includes or excludes. This arbitrariness is due to the lack of consistent conceptual foundations. Apparently, the index is trying to measure "sustainable utility". But this ambition reveals two fundamentals contradictions.

First, being highly subjective "utility" cannot be measured by any objective index. For example, personal consumption is discounted by income inequality on the reasonable assumption that rising income inequality hinders economic welfare (Hsing, 2005), but why the Gini index is used instead of other measures is unclear,[13] neither the assumption of a linear function between growth in inequality (whatever the corresponding index may be) and reduction in welfare is discussed and justified. Moreover, as emphasized by Neumayer (1999), GPI does not allow for corrections for other dimensions having an effect on utility, such as degree of political freedom or degree of inequality between sexes. Still, disservice items (such as commuting costs, the loss of leisure, etc.) are highly subjective and cannot be computed on the basis of objective measures: for example, the loss of leisure is measured in terms of the average real wage rate, but this can hardly be the same for every citizen: rather, every citizen should have computed her/his own leisure time in terms of his/her own wage rate; furthermore, as stressed among the others by Rymes (1992) and Lawn (2005), it is unclear whether or not these disservice costs have been already included into household and worker decisions. Indeed, the only way of measuring utility consistent with the utility approach should be to subjectively quantify the utility of each person, for example by asking people how much they are happy. This is what the Happy Planet Index tries to do, but this method does not escape the overall

[13] As known, the Gini index has some mathematical limitations: it tends to increase with the size of the population (and thus of the country) and does not perfectly replicate income distribution (because of differing shapes of the Lorenz curves, two countries scoring the same Gini index and the same income average may have a very different income distribution).

criticism to the utility approach, as formulated most notoriously by Amartya Sen (1999; see forward).

The second contradiction comes with the adjective "sustainable". As pointed out efficaciously by Dietz and Neumayer (2006, p. 189), it is "not possible to combine an indicator of current welfare with an indicator of sustainability": the depletion of non-renewable resources, in fact, can hardly have an impact on *current* welfare, i.e. on utility. However, deductions for natural capital depletion have some foundations in the economic theory, as pointed out by defenders of GPI such as Lawn (2003), in fact they are consistent with the traditional Fisher's definition of capital and income (Fisher, 1906). The point here is that the concepts of capital and income should be properly linked to the wealth approach, rather than to the utility one, i.e. used to refine and improve GDP. But this is another matter (see next section). For now, let's just turn our attention to the Happy Planet Index.

The Happly Planet Index (HPI) is a measure of the ecological efficiency of supporting well-being. Its formula looks more straightforward than GPI's and, by some regards, more appealing. The only three components are life expectancy, life satisfaction, and the ecological footprint. Via multiplying life expectancy by life satisfaction, a composite indicator called Happy Life Years (HLY) is estimated, which is then divided by the Ecological Footprint (EF) to calculate the index; the addition of two constant (α and β) is also necessary, in order to standardize variations and then tradeoffs among the components:[14]

$$(8)\quad HPI = [\, HLY / (EF + \alpha) \,] \times \beta.$$

Data on life satisfaction are obtained by asking to a sample of people a simple question: *All things considered, how satisfied are you with your life as a whole these days?*, with responses ranging from 0 (unsatisfied) to 10 (satisfied) (Abdallah *et al.*, 2009, p. 52). The ecological footprint of an individual (per capita), expressed in units of "global hectares", is a measure of the amount of land required to provide for all her/his resource requirements, plus the amount of vegetated land required to absorb all her/his CO_2 emissions and the CO_2 emissions embodied in the products she/he consumes.[15] Estimates of global hectares allow to estimate the total amount of productive hectares available on the entire planet: by dividing this amount by the world's population, it is then possible to calculate a global per capita figure, «on the basis that everyone is entitled to the same amount of the planet's natural resources» (id., p. 12).

[14] Their value changes according to the values in the sample: in the 2005 report, α was 3.35 and β 6.42; see the report (Abdallah et al., 2009), pp. 54 and 60, for more details. In the 2012 HPI report some refinements on the statistical adjustments are introduced (Abdallah et al., 2012, pp. 20-21), following Eurostat (2012).

[15] Ecological footprint data for 2005 were available from WWF (2008).

Although this methodology is still a matter of some discussion, the ecological footprint is an objective measure (at least, one aiming to be so), with no arbitrariness. This is true also for life expectancy, of course, but the same can't be said for life satisfaction, its importance (Layard, 2011) and considerable efforts in producing and collecting measures of happiness (Helliwell *et al.*, 2012) notwithstanding. Thus the HPI is an indicator combining objective and subjective measures of well-being. In conceptual terms, it looks like a mixture of the utilitarian and the wealth approach. Life satisfaction is an utilitarian measure, whereas life expectancy and the ecological footprint are measures of wealth (respectively, the number of years an individual has, and a measure of the ecological efficiency in order to produce a certain amount of wealth).

The problem is that the utilitarian and the wealth approach are not reconcilable. More in detail, utilitarian measures, being subjective, should not be used as indices of economic performance together with wealth indices. Amartya Sen (1999, pp. 54–110) has made a good point against the use of utilitarian measures as objective indicators, and his lesson should not be overlooked. The two main problems are distributional indifference (happiness can be less costly for some people, but it would be unfair to give these people lesser opportunities) and – even a worse one, when it comes to cross-country comparisons – adaptation and mental conditioning: people can adapt to oppressive situations, and thus the utilitarian approach can be unfair towards people living in oppressive countries, ending up by justifying those oppressions (in the largest sense, including also the oppressions deriving from a lack of material resources).[16] This in part what happens with HPI: in the top ten ranking we find countries such as Guatemala and Honduras (Abdallah *et al.*, 2009, p. 61), where life is hard by any objective standard. Such amazing results look, indeed, unacceptable by any reasonable standard.

[16] A solution to these problems can be the use of positional interpretations, which take into account the social stratification of the interviewed people; intermediate between opinions and objective facts, «objective in the sense that they may convey a reflected evaluation and engagement», positional interpretations «can be seen as points of contact between individuals and the social structures in which they live» (Comim and Amaral, 2013, p. 5). They are used in the construction of the Human Value Index (HVI), a composite indicator on the line of HDI, which aims to build a bridge between the capability approach and the subjective well-being one. Up to the present, HVI has been proposed only for Brazil (ibid) and, even after accepting the validity of the positional interpretations approach, it may be subject to the same criticisms raised against HDI.

4. THE WEALTH APPROACH: HOW TO BUILD A MORE INCLUSIVE SYSTEM OF NATIONAL ACCOUNTS (AND WHY IT DID NOT SUCCEED)

The enduring success of GDP is due, by first instance, to its coherent conceptual foundations, which can be referable to the wealth approach. In a nutshell, GDP is a monetary measure of the amount of resources (goods and services) saleable in the market that an economy can produce (Beckerman, 1987; Feinstein, 1987; Lequiller and Blades, 2006). It is therefore a measure of income, i.e. of the wealth produced in a certain time period (one year, one month, etc.). Wealth, or resources, are something we can measure with a reasonable degree of "objectivity",[17] unlike with capabilities or utilities, the "functions" underlying alternative indices. That said, it doesn't mean that there is no room for discussion about the components and the measures of wealth. There is indeed, the debate is large and old, and as a consequence there is now theoretical consensus and empirical data on how to refine GDP in order to include, at the very least, environmental costs – as we are going to illustrate. However, the very fact that so far not even refined measures of GDP, which safely remain within the borders of the wealth approach, have been successful, leads us to the second, more profound and fundamental reason behind GDP enduring primacy: it was the indicator thought to measure economic change in capitalist-market economies,[18] where we still live today; the prevailing values in these societies, and the interests of their dominant social actors, are informed to the dimensions which are directly measured by GDP (or GDP). Other dimensions incorporated by alternative indices are not of their immediate concern.

Let's make two basic examples. There are two fundamental adjustments to GDP which have been proposed and can be considered within the wealth approach: the system of national accounts should be expanded to include (mostly women's) unpaid work and the value of environment. Both these issues have been brought to relevance by the seminal book of Marilyn Waring, *If women counted*, published about a quarter of a century ago (Waring, 1988), but were a subject of academic discussion at least since the 1970s. Concerning unpaid work, it is fair to acknowledge that the Genuine Progress Indicator has made some efforts to include it, although limitedly to the United

[17] Some cautiousness is warranted on this too, however. Objectiveness can be achieved if we assume that market prices tend to the cost of production (or to some other objective measure), as assumed for example in classical political economy. But if market prices depend upon subjective factors such as subjective preferences, as in marginal utility theory, there is no objectivity anymore. In fact, GDP reflects the values of capitalist society, and this becomes manifest in market prices, and in the quantities produced too. John Kenneth Galbraith (1958) famously noted this, and his discussion remains most relevant today.

[18] The first official estimates of national income were published in the US in 1934 by the National Bureau of Economic Research, with the decisive contribution by Simon Kuznets (cfr. Carson, 1975).

States, by counting the value of household work and parenting. The procedure has been developed by John Kendrick (1979), whose idea was to calculate the non-market household production as the product of the hourly wages of domestic workers and the number of hours devoted to unpaid household work. Following this approach, for the US Robert Eisner (1989) has produced benchmark estimates (for 1965, 1975 and 1981) via using the annual hours spent performing relevant household tasks as calculated by the Michigan Survey Research Center, at their market price (i.e., the amount that a family would have to pay to hire someone to do equivalent work in their home); GPI's researchers have later extended Eisner's data to cover more benchmarks (1985, 2003, 2004) (Talberth, Cobb, and Slattery, 2007, p. 9). Such methodology looks reasonably reliable, although subject to a number of assumptions, but it is also highly data demanding – and this is the reason why to replicate the GPI's figures for other countries different from the US goes well beyond the scope of this article. It is worth noticing, however, that the share of the value of houserwork and parenting is all but irrilevant, usually higher the lower GDP is: for the US, it passed from about two thirds of personal consumption in 1950, to about one third in 2004 (my calculations from ibid, p. 21).

Recent research has also emphasized as environmental accounting can be reconciled with the system of national accounts, i.e., as the contributions of nature to human welfare can be defined and measured in a way consistent with the wealth approach (Boyd and Banzhaf, 2007; Ferreira *et al.*, 2008).[19] Dimensions as the depletion and degradation of natural resources, the consumption of fixed capital, and the negative consequences of pollution, can be included in the GDP or GDP indices. Unlike with unpaid work, in this case the value of these components is relatively easy to obtain from official international sources. For instance, an environment-augmented GDP (GDP^e) can be calculated as:

$$(9)\ GDP^e = GDP - CFC - MD - ED - NFD - CDD - WPD - PED;$$

where GDP is Gross National Income, i.e. the sum of value added by all resident producers plus any product taxes (less subsidies) not included in the valuation of output plus net receipts of primary income (compensation of employees and property income) from abroad; CFC is consumption of fixed capital (the replacement value of capital used up in the process of production); MD is an estimate of mineral depletion; ED is an estimate of energy depletion; NFD is an estimate of net forest depletion; CDD is an estimate of carbon oxide damage (basic air pollution); WPD is an estimate of water pollution damage (water pollution); PED is an estimate of particular emission damage

[19] For a broader discussion of ecological economics and of its connections with the neoclassical school and with heterodox economics, see Douai *et al.* (2012), Özkaynak *et al.* (2012), Spash and Ryan (2012).

(other pollution). Almost all of the necessary data for these variables (GDP, CFC, MD, ED, NFD, CDD, PED), can be taken from the World Bank dataset (World Bank, 2013); only WPD (water pollution damage) has to be estimated, as the product of the organic water pollutant emissions (from the same source) and the average cost per kg/day of water pollutant (from Dodds *et al.*, 2009).[20] As a result, from the sources above I have produced estimates of GDP^e for 130 countries, in 2005;[21] in table 1 and figure 1 these are presented and compared with the standard GDP, as well as with the new HDI and with HPI.

[Table 1 here]

As expected, there is a high correlation between GDP and GDP^e, the main difference being that this latter lowers the value of oil exporting countries (most remarkably Saudi Arabia, Kuwait, Norway, Trinidad and Tobago, all outliers in the upper left quadrant of figure 1) which are heavily depleting their energy wealth. GDP^e also displays a higher correlation with the new HDI and with HPI than the standard GDP does. It should not pass unnoticed, however, that the regression line which best fits the correlation between GDP/GDP^e and the new HDI, and to a much minor extent also HPI, is a cubic or a quadratic one:[22] this suggests the existence of a non-monotonic relationship between income and either human development or well-being, and the use of an environment-augmented GDP only confirms this finding.

[Figure 1 here]

In short, an environment-augmented GDP would meet some of the concerns motivating the supporters of HDI and HPI, while being at the same conceptually consistent with the wealth approach and even more capable of measuring the effective capacity of producig income (by making some distinction between the production of income and the exploitment of natural resources) than the standard GDP. Morevoer, it would not be so difficult to produce world statistics of environment-corrected GDP or GDP, as we have seen. But then, why such attempts of environmental ac-

[20] In more detail, the average cost per kg/day of water pollutant has been estimated using data on total potential annual value losses due to water pollution (losses in recreational water usage, waterfront real estate, spending on recovery of threatened and endangered species, and drinking water) for the United States in 2008 (Dodds *et al.*, 2009); the total was divided by the US organic water pollutant emission in 2008 (World Bank, 2011), and extrapolated backward to 2005 using the cost of living index; the average cost per kg/day of water pollutant for the United States was then applied to other countries after being converted through PPP coefficients (from the same source).

[21] In order to have comparable figures, all the data for (9) have been expressed at purchasing power parities (international PPP dollars, deflators are also from World Bank, 2011).

[22] The fit lines are the following. Between GDP and new HDI: 0.633 linear, 0.842 quadratic, 0.862 cubic. Between GDP^e and the new HDI: 0.644 linear, 0.873 quadratic, 0.896 cubic. Between GDP and HPI: 0.001 linear, 0.116 quadratic, 0.136 cubic. Between GDP^e and HPI: 0.002 linear, 0.119 quadratic, 0.141 cubic.

counting have passed almost unnoticed thus far? The answer could be that the standard GDP reflects the prevailing values of our societies, that are capitalist-market economies, and their interests and goals, better than possible alternatives do. Namely, standard GDP measures the income which is produced and sold in the market. Neither housework, by definition, not even environmental goods are produced and sold in the market, even though they can be substitutes of saleable goods and services (in fact, this is the way they are computed in the wealth accounting). Indeed, housework and enviroment wealth is not a one that is currently monetized and exchanged in the market (and even to treat it as a market good is an artifice): our capitalist-market economies are relatively uninterested in it.

Having this answer in mind, we can look at the debate about composite indicators with clearer eyes. Each composite indicator, in its weights and components, reflects the preferences of a society. These are the product of the way the society is organized, of the struggle between different players and social actors, of the resulting prevailing values and interests. As we have seen, the idea which motivated the birth of HDI – and in the end of all the composite indicators which followed – was to provide one single number which would serve as guide to policy makers (UNDP, 1999, p. 23), a one which would take into account social and environmental dimensions. But this wish is based on the illusion that the policy maker is a neutral actor, who could only be glad to take an indicator more inclusive than GDP, if available. Instead, the policy maker is the result of social dynamics, and social struggle, and would take an indicator alternative to GDP only after – and not before – the preference system of a society has changed. Such a new indicator could be a composite one, an improved version of GDP as the one we have presented in this section, or even another simple indicator radically different from GDP: life expectancy, for instance, if the dominant value of a society becomes longevity rather than money; education, if it becomes knowledge; the degree of personal freedom; the per capita amount of clean air, and so on.

Meantime, the different groups of a society contend to affirm their competing values. The primacy of GDP is questioned by those groups who devalue monetary wealth in favour of other dimensions, from environment to well-being, to knowledge or freedom, and thus (implicitly or explicitly) are proposing a different society than the current capitalist-market one. Since the invention of HDI, the art of producing indicators ex cathedra has flourished. They can be useful for historical analysis (Prados, 2013) or to enrich the development debate,[23] but in terms of policy guidance, that is for the social actors who confront each other, as we have seen composite indicators are useless and even confusing, given that: 1) they hide more than they highlight; 2) they take for granted dif-

[23] In Ravallion's words: «Composite indices derived from development-data mashups are often trying to attach a number to an important, but unobserved, concept, for which prevailing theories and measurement practices offer little guidance» (2012a, p. 24).

ferent preference systems, which have not come to light from the social corpus (and arguably do not exist).

So, what should we do? Two competing alternative strategies can be followed, their viability depending upon the researcher's goals. One is the multivariate analysis, which does not superimpose any given system of preferences and values, but derives it from the empirical analysis of the observed sample (e.g. Munda, 2012). Although from theoretical grounds it is an intriguing tool, for (our) practical purposes it can hardly be regarded as a viable path. It has not only computational problems in the presence of a high number of observations, as Munda (ibid, p. 19) acknowledges, but also a potential bias due to the way the sample is constructed: the weighting schemes (and of course the results) are dependent on the indicators and countries selected. Therefore it can be useful to solve specific policy problem, in the presence of different and competing preference systems, but to claim for a general validity it should include all the possible indicators reflecting all the range of different preferences, for all the possible cases of the sample (in our case, for all the countries of the world) – virtually impossible.

The other strategy is a dashboard approach, as proposed among the others by Ravallion (2011) for poverty assessment, i.e. the use of a battery of indicators, each one reflecting one dimension and thus tracking a specific problem. While in principle it has not pretension of general value, it may be a good policy instrument, insofar it provides each social groups struggling to pursue its own goal, and thus hoping to change the society accordingly to its own values and interests, with its proper quantitative backing. GDP is only one of these dashboard indicators: it is the one with general value, up to the present, simply because it reflects the values and interests of the capitalist-market societies of our days.

5. CONCLUSIONS

In the last decades several composite indices have been proposed, in order to measure economic development or prosperity in a more inclusive way that the standard system of national accounts does. Despite considerable efforts and a lot of debate, however, thus far none of these has proved itself able to replace the standard GDP. In order to find the reasons of this failure, the first part of the article has critically reviewed what are currently the most popular indices alternative to GDP, that is the Human Development Index, the Genuine Progress Indicator, and the Happy Planet Index. These composite indicators are here criticized on the argument, so far relatively overlooked, of their faulty conceptual foundations: a case is made that neither the capability approach nor utilitarianism are suitable to be conveyed into an objective measure which can serve as a guide for policy makers; unlike the wealth approach, the one behind GDP and the system of national accounts. In the second part of the article, we have argued that well-being and ecological goals, the main concerns motivating the indices alternative to GDP, can instead be coherently included into an extended wealth approach, that is into the same conceptual framework underlying the current system of national accounts. Limitedly to the environmental component, an example is provided for the world countries, using data from the World Bank. Such improvements upon the standard national accounting turn out ot be relatively feasible and theoretically consistent, and yet up to the present neither these have been successful in supplanting the traditional measures. This second failure suggests that among the reasons behind the enduring success of GDP there are not only conceptual consistency, or statistical soundness, but also «social suitability», being the standard system of national accounts better able to reflect the dominant values of our capitalist-market economies, where it was developed, and their related prevailing interests. As far as environmental and social components are not directly produced and sold in the market, even though they can be measured at market prices they are of little interest to capitalist-market societies.

Once we acknowledge that composite indicators cannot be superimposed upon the actual structure of a given society, but are rather the product of a prevailing preference system upon others, we realize that searching for and developing composite indicators alternative to GDP is trivial, until when the current preference system has not been changed. And in order to achieve such a change composite indicators can even be misleading, since as we have seen their underlying preference system is all but intelligible, and it may even be at odds with their conceptual foundations. By this regard, a dashboard approach is preferable since it provides the different social groups with clear and

undisputable quantitative instruments. Let's change the society, maybe using a dashboard of measurement instruments as a guidance for that: and then the alternative to GDP, with a new universal breadth, will come out from the new prevalining values and interests. Not viceversa. Or alternatively, believe in and pursue a society where no longer there are dominant groups and interests: that would be the world of the dashboard approach, and maybe of the multivariate analysis to solve specific policy problems in a multiple system of preferences.

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Table 1. GDP, GDP^{e}, new HDI and HPI for 130 countries, 2005

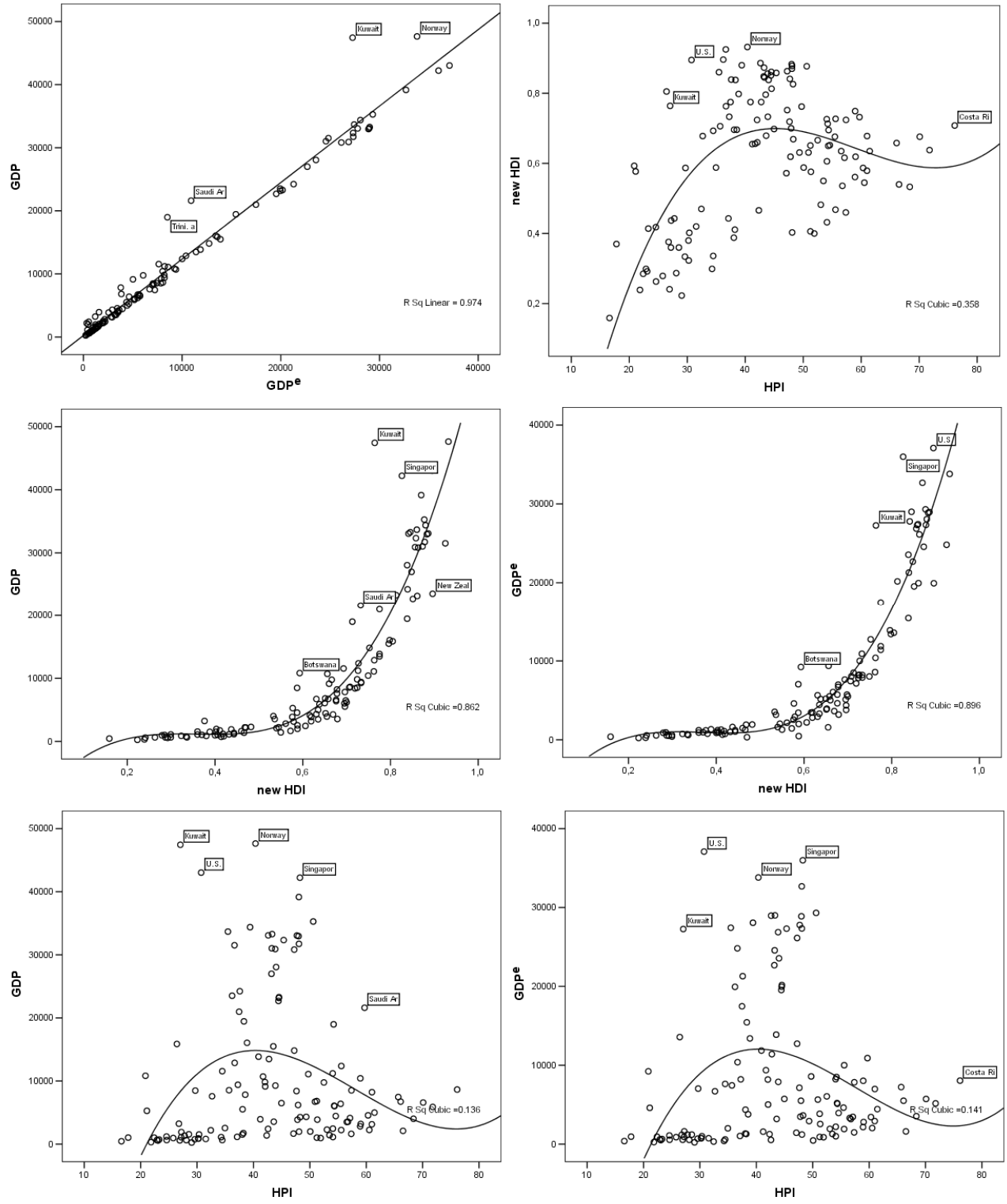
Absolute figures						Country ranks					
Country	**Population**	**GDP**	**GDP^{e}**	**new HDI**	**HPI**	**Rank**	**GDP**	**GDP^{e}**	**new Hdi**	**HPI**
	(million)	2005 PPP $	2005 PPP $	(0-1)	(0-100)					
Albania	3,154	6197	5500	0.700	47.91	1	Norway	United States^{+2}	Norway	Costa Rica^{+48}
Algeria	32,854	6820	3843	0.651	51.23	2	Kuwait	Singapore^{+2}	Australia^{+13}	Dominican R.$^{+65}$
Angola	16,095	3238	1191	0.376	26.78	3	United States	Norway^{-2}	New Zealand^{+19}	Jamaica^{+58}
Argentina	38,747	10424	8027	0.749	58.95	4	Singapore	Switzerland^{+1}	United States^{-1}	Guatemala^{+72}
Armenia	3,018	4274	3636	0.669	48.28	5	Switzerland	Netherlands^{+1}	Ireland^{+5}	Vietnam^{+89}
Australia	20,400	31513	24820	0.925	36.64	6	Netherlands	United King.$^{+3}$	Sweden^{+6}	Colombia^{+53}
Austria	8,233	33052	27781	0.841	47.69	7	Canada	Ireland^{+3}	Canada	Cuba^{+50}
Azerbaijan	8,392	3937	1581	0.655	41.21	8	Denmark	Sweden^{+4}	Germany^{+6}	El Salvador^{+62}
Bangladesh	153,281	1123	997	0.432	54.09	9	United King.	Canada^{-2}	Netherlands^{-3}	Brazil^{+45}
Belarus	9,776	8543	7443	0.706	35.67	10	Ireland	Austria^{+1}	Japan^{+6}	Honduras^{+75}
Belgium	10,479	32335	27317	0.858	45.36	11	Austria	Denmark^{-3}	Switzerland^{-6}	Nicaragua^{+80}
Benin	8,490	1205	1093	0.418	24.58	12	Sweden	Germany^{+2}	Finland^{+6}	Egypt^{+59}
Bolivia	9,182	4321	2919	0.631	49.35	13	Belgium	Belgium	Israel^{+11}	Saudi Arabia^{+13}
Bosnia-Herz.	3,781	6496	5730	0.698	44.96	14	Germany	Kuwait^{-12}	Denmark^{-6}	Philippines^{+70}
Botswana	1,836	10831	9229	0.593	20.85	15	Australia	France^{+2}	Belgium^{-2}	Argentina^{+28}
Brazil	186,831	8228	6986	0.678	61.01	16	Japan	Finland^{+2}	France^{+1}	Indonesia^{+70}
Bulgaria	7,740	9837	8188	0.724	42.04	17	France	Australia^{-2}	Korea (South)$^{+8}$	Panama^{+34}
Burkina Faso	13,933	1023	931	0.285	22.40	18	Finland	Japan^{-2}	Spain^{+2}	Laos^{+82}
Burundi	7,859	311	258	0.239	21.84	19	Italy	Italy	United King.$^{-10}$	China^{+56}
Cambodia	13,956	1377	1262	0.466	42.34	20	Spain	Spain	Austria^{-9}	Morocco^{+61}
Cameroon	17,795	1904	1619	0.437	27.22	21	Greece	Greece	Greece	Sri Lanka^{+61}
Canada	32,312	34377	28062	0.880	39.40	22	New Zealand	Slovenia^{+1}	Italy^{-3}	Mexico^{+15}
Centr. Afr. R.	4,191	643	597	0.299	22.88	23	Slovenia	Israel^{+1}	Czech R.$^{+6}$	Pakistan^{+69}
Chad	10,146	1108	403	0.299	34.27	24	Israel	New Zealand^{-2}	Singapore^{-20}	Ecuador^{+39}
Chile	16,295	11094	8579	0.762	49.72	25	Korea (South)	Korea (South)	Slovenia^{-2}	Jordan^{+47}
China	1304,500	4131	3456	0.616	57.11	26	Saudi Arabia	Portugal^{+1}	Estonia^{+5}	Peru^{+40}
Colombia	44,946	6736	5502	0.658	66.10	27	Portugal	Czech R.$^{+1}$	Hungary^{+3}	Tunisia^{+38}
Congo	3,610	2196	325	0.470	32.43	28	Czech R.	Slovakia^{+4}	Slovakia^{+4}	Trini. and Tob^{+1}.
Congo-D.Rep.	58,741	255	227	0.223	29.04	29	Trini. and Tob.	Estonia^{+2}	Portugal^{-2}	Bangladesh^{+80}
Costa Rica	4,327	8648	8051	0.708	76.12	30	Hungary	Hungary	Lithuania^{+5}	Moldova^{+58}
Croatia	4,443	14824	12732	0.752	47.23	31	Estonia	Croatia^{+2}	Poland^{+6}	Malaysia^{+8}
Cuba	11,260	7462	7231	n.a.	65.68	32	Slovakia	Lithuania^{+2}	Kuwait^{-30}	Tajikistan^{+72}
Czech R.	10,234	19452	15441	0.838	38.31	33	Croatia	Poland^{+2}	Latvia^{+3}	India^{+57}
Denmark	5,416	33677	27428	0.860	35.47	34	Lithuania	Saudi Arabia^{-8}	Chile^{+6}	Venezuela^{+11}
Dominican R.	9,470	5893	5160	0.638	71.78	35	Poland	Latvia^{+1}	Croatia^{-2}	Nepal^{+81}
Ecuador	13,061	6385	4627	0.676	55.46	36	Latvia	Mexico^{+1}	Argentina^{+7}	Syrian Arab R.$^{+42}$
Egypt	72,850	4561	3428	0.587	60.32	37	Mexico	Turkey^{+5}	Romania^{+10}	Myanmar^{+76}
El Salvador	6,668	4992	4433	0.635	61.46	38	Russian Fed.	Botswana^{+3}	Uruguay^{+9}	Algeria^{+21}
Estonia	1,346	15871	13569	0.805	26.42	39	Malaysia	Chile^{+1}	Saudi Arabia^{-13}	Thailand^{+21}
Ethiopia	75,173	627	540	0.287	28.10	40	Chile	Trini. and Tob.$^{-11}$	Mexico^{-3}	Netherlands^{-34}
Finland	5,246	30826	26132	0.863	47.23	41	Botswana	Malaysia^{-2}	Malaysia^{-2}	Uzbekistan^{+54}
France	60,873	30908	26869	0.856	43.86	42	Turkey	Uruguay^{+4}	Bulgaria^{+2}	Chile^{-2}
Georgia	4,473	3555	3190	0.679	43.60	43	Argentina	Bulgaria^{+1}	Panama^{+9}	Bolivia^{+30}
Germany	82,469	31736	27336	0.878	48.07	44	Bulgaria	Costa Rica^{+5}	Serbia^{+9}	Armenia^{+30}
Ghana	22,535	1146	1031	0.443	37.10	45	Venezuela	Argentina^{-2}	Trini. and Tob.$^{-16}$	Singapore^{-41}
Greece	11,104	24224	21290	0.839	37.58	46	Uruguay	Romania^{+1}	Costa Rica^{+3}	Yemen^{+50}
Guatemala	12,710	4014	3542	0.533	68.37	47	Romania	Panama^{+4}	Belarus^{+3}	Germany^{-33}
Guinea	9,003	882	744	0.323	30.25	48	Iran	Russian Fed.$^{-10}$	Albania^{+16}	Switzerland^{-43}
Honduras	6,834	3144	2923	0.579	60.99	49	Costa Rica	Belarus^{+1}	Bosnia-Herz^{+13}	Sweden^{-37}
Hungary	10,087	16055	13401	0.798	38.86	50	Belarus	Cuba^{+7}	Ukraine^{+18}	Albania^{+14}
India	1094,583	2292	1934	0.482	53.03	51	Panama	Serbia^{+2}	Kazakhstan^{+5}	Paraguay^{+28}
Indonesia	220,558	2820	2159	0.561	58.92	52	South Africa	South Africa	Peru^{+14}	Austria^{-41}
Iran	69,087	9144	5016	0.660	42.08	53	Serbia	Brazil^{+1}	Russian Fed^{-15}	Serbia
Iraq	29,267	2417	534	n.a.	42.59	54	Brazil	Macedonia^{+2}	Georgia^{+26}	Finland^{-36}
Ireland	4,159	33081	28961	0.886	42.62	55	Kazakhstan	Venezuela^{-10}	Brazil^{-1}	Croatia^{-21}
Israel	6,924	23166	19953	0.861	44.49	56	Macedonia	Bosnia-Herz.$^{+6}$	Macedonia^{+1}	Kyrgyzstan^{+43}
Italy	58,607	28056	23558	0.838	44.02	57	Cuba	Jamaica^{+4}	Jamaica^{+4}	Belgium^{-44}
Jamaica	2,655	6590	5722	0.676	70.09	58	Algeria	Thailand^{+2}	Ecuador^{+6}	Bosnia-Herz.$^{+4}$
Japan	127,773	31026	24567	0.873	43.25	59	Colombia	Colombia	Armenia^{+15}	Slovenia^{-36}
Jordan	5,412	4450	3943	0.652	54.59	60	Thailand	Albania^{+4}	Venezuela^{-15}	Israel^{-36}
Kazakhstan	15,147	7832	3783	0.696	38.54	61	Jamaica	Tunisia^{+4}	Iran^{-13}	Korea (South)$^{-36}$
Kenya	35,599	1347	1205	0.443	27.77	62	Bosnia-Herz.	Dominican R.$^{+5}$	Colombia^{-3}	Italy^{-43}
Korea (South)	48,294	22688	19535	0.851	44.43	63	Ecuador	Peru^{+3}	Turkey^{-21}	Romania^{-16}
Kuwait	2,535	47440	27268	0.764	27.04	64	Albania	Iran^{-16}	Azerbaijan^{+13}	France^{-47}
Kyrgyzstan	5,144	1666	1440	0.572	47.09	65	Tunisia	Ecuador^{-2}	Jordan^{+7}	Georgia^{+15}
Laos	5,664	1627	1487	0.460	57.34	66	Peru	Namibia^{+3}	Algeria^{-8}	Slovakia^{-34}
Latvia	2,301	12872	10384	0.763	36.67	67	Dominican R.	El Salvador^{+3}	Tunisia^{-2}	United King.$^{-58}$
Lithuania	3,414	13857	11859	0.775	40.90	68	Ukraine	Ukraine	Dominican R.$^{-1}$	Japan^{-52}
Macedonia	2,034	7585	6701	0.678	32.66	69	Namibia	Jordan^{+3}	Sri Lanka^{+13}	Spain^{-49}
Madagascar	18,643	820	746	0.420	31.54	70	El Salvador	Algeria^{-12}	El Salvador^{+1}	Poland^{-35}
Malawi	13,226	638	592	0.336	34.47	71	Egypt	Kazakhstan^{-16}	Thailand^{-11}	Ireland^{-61}
Malaysia	25,653	11207	8227	0.726	54.05	72	Jordan	Armenia^{+2}	Bolivia^{+2}	Iraq^{+17}

Mali	11,611	965	881	0.279	25.77	73	Bolivia	Guatemala^{+3}	Philippines^{+11}	Cambodia^{+32}
Mauritania	2,963	1744	1288	0.411	38.21	74	Armenia	Paraguay^{+5}	Paraguay^{+6}	Iran^{-26}
Mexico	103,089	12379	10002	0.727	55.58	75	China	China	China	Bulgaria^{-31}
Moldova	3,877	2453	2201	0.606	54.08	76	Guatemala	Egypt^{-5}	Moldova^{+12}	Turkey^{-34}
Mongolia	2,554	2550	2004	0.588	34.95	77	Azerbaijan	Sri Lanka^{5}	Botswana^{-36}	Azerbaijan
Morocco	30,143	3543	3171	0.536	56.75	78	Syrian Arab R.	Georgia^{+2}	Mongolia^{+9}	Lithuania^{-44}
Mozambique	20,533	640	555	0.263	24.61	79	Paraguay	Morocco^{+2}	Uzbekistan^{+17}	Norway^{-78}
Myanmar	47,967	1026	913	0.406	51.23	80	Georgia	Honduras^{+5}	South Africa^{-28}	Canada^{-73}
Namibia	2,020	5277	4599	0.577	21.10	81	Morocco	Bolivia^{-8}	Egypt^{-9}	Hungary^{-51}
Nepal	27,094	963	874	0.400	51.91	82	Sri Lanka	Philippines^{+2}	Honduras^{+3}	Kazakhstan^{-27}
Netherlands	16,320	35274	29312	0.877	50.60	83	Angola	Syrian Arab R.$^{-5}$	Namibia^{-14}	Czech R.$^{-55}$
New Zealand	4,134	23513	19938	0.896	36.21	84	Philippines	Moldova^{+4}	Syrian Arab R.$^{-6}$	Mauritania^{+14}
Nicaragua	5,463	2248	2038	0.545	60.54	85	Honduras	Indonesia^{+1}	Kyrgyzstan^{+14}	Ukraine^{-17}
Niger	13,264	596	556	0.241	26.94	86	Indonesia	Nicaragua^{+5}	Indonesia	Senegal^{+17}
Nigeria	141,356	1525	1002	0.402	30.35	87	Mongolia	Mongolia	Tajikistan^{+17}	Greece^{-66}
Norway	4,623	47636	33799	0.932	40.36	88	Moldova	India^{+2}	Nicaragua^{+3}	Portugal^{-61}
Pakistan	155,772	2230	1910	0.468	55.56	89	Iraq	Pakistan^{+3}	Vietnam^{+5}	Uruguay^{-43}
Panama	3,232	8516	7844	0.724	57.37	90	India	Cameroon^{+7}	Morocco^{-9}	Ghana^{+18}
Paraguay	5,899	3870	3478	0.619	47.80	91	Nicaragua	Vietnam^{+3}	Guatemala^{-15}	Latvia^{-55}
Peru	27,274	6027	5112	0.695	54.37	92	Pakistan	Azerbaijan^{-15}	India^{-2}	Australia^{-77}
Philippines	84,566	3202	2805	0.619	59.02	93	Congo	Laos^{+7}	Congo	New Zealand^{-71}
Poland	38,165	13481	11404	0.775	42.75	94	Vietnam	Kyrgyzstan^{+5}	Pakistan^{-2}	Belarus^{-44}
Portugal	10,549	20978	17475	0.775	37.46	95	Uzbekistan	Senegal^{+8}	Cambodia^{+10}	Denmark^{-87}
Romania	21,634	9276	7891	0.733	43.89	96	Yemen	Mauritania^{+8}	Laos^{+4}	Mongolia^{-9}
Russian Fed.	143,150	11558	7631	0.693	34.47	97	Cameroon	Tajikistan^{+2}	Kenya^{+9}	Russian Fed.$^{-59}$
Rwanda	9,234	766	695	0.334	29.59	98	Mauritania	Cambodia^{+7}	Ghana^{+11}	Malawi^{+27}
Saudi Arabia	23,119	21613	10905	0.732	59.70	99	Kyrgyzstan	Yemen^{-3}	Cameroon^{-2}	Chad^{+11}
Senegal	11,770	1519	1335	0.388	38.03	100	Laos	Sudan^{+1}	Bangladesh^{+9}	Macedonia^{-44}
Serbia	7,441	8407	7146	0.719	47.63	101	Sudan	Kenya^{+5}	Madagascar^{+18}	Congo^{-8}
Sierra Leone	5,586	566	508	0.292	23.08	102	Nigeria	Angola^{-19}	Benin^{+5}	Madagascar^{+17}
Singapore	4,266	42218	35980	0.826	48.24	103	Senegal	Benin^{+4}	Togo^{+18}	United States^{-100}
Slovakia	5,387	15496	13880	0.796	43.52	104	Tajikistan	Ghana^{+4}	Mauritania^{-6}	Nigeria^{-2}
Slovenia	2,001	23293	20173	0.813	44.53	105	Cambodia	Nigeria^{-3}	Myanmar^{+8}	Guinea^{+12}
South Africa	46,892	8480	7039	0.587	29.69	106	Kenya	Bangladesh^{3}	Yemen^{-10}	Uganda^{+12}
Spain	43,398	26991	22683	0.848	43.19	107	Benin	Tanzania^{+5}	Nigeria^{-5}	South Africa^{-55}
Sri Lanka	19,668	3502	3307	0.635	56.55	108	Ghana	Burkina Faso^{+6}	Nepal^{+8}	Rwanda^{+12}
Sudan	36,900	1557	1207	0.360	28.55	109	Bangladesh	Zambia^{+2}	Senegal^{-6}	Congo-D.Rep.$^{+21}$
Sweden	9,024	32958	28881	0.883	47.99	110	Chad	Myanmar^{+3}	Uganda^{+8}	Sudan^{-9}
Switzerland	7,437	39157	32678	0.870	48.05	111	Zambia	Mali^{+4}	Angola^{-28}	Ethiopia^{+14}
Syrian Arab R.	18,894	3879	2551	0.576	51.32	112	Tanzania	Nepal^{+4}	Tanzania	Kenya^{-6}
Tajikistan	6,550	1427	1288	0.550	53.48	113	Myanmar	Uganda^{+5}	Zambia^{-2}	Cameroon^{-16}
Tanzania	38,478	1038	947	0.370	17.79	114	Burkina Faso	Madagascar^{+5}	Sudan^{-12}	Zambia^{-3}
Thailand	63,003	6724	5643	0.631	50.90	115	Mali	Guinea^{+2}	Malawi^{+9}	Kuwait^{-113}
Togo	6,239	729	652	0.414	23.28	116	Nepal	Rwanda^{+4}	Rwanda^{+4}	Niger^{+10}
Trini. and Tob.	1,324	18979	8504	0.713	54.21	117	Guinea	Togo^{+4}	Guinea	Angola^{-34}
Tunisia	10,029	6076	5207	0.650	54.31	118	Uganda	Centr. Afr. R.$^{+4}$	Centr. Afr. R.$^{+4}$	Estonia^{-87}
Turkey	72,065	10710	9372	0.656	41.70	119	Madagascar	Malawi^{+5}	Chad^{-8}	Mali^{-4}
Uganda	28,947	871	769	0.380	30.21	120	Rwanda	Niger^{+6}	Sierra Leone^{+7}	Mozambique^{+3}
Ukraine	47,105	5520	4366	0.696	38.07	121	Togo	Mozambique^{+2}	Ethiopia^{+4}	Benin^{-14}
United King.	60,226	33279	29000	0.845	43.31	122	Centr. Afr. R.	Ethiopia^{+3}	Burkina Faso^{-8}	Togo^{-1}
United States	296,507	43023	37087	0.895	30.73	123	Mozambique	Iraq^{-34}	Mali^{-8}	Sierra Leone^{+4}
Uruguay	3,306	9403	8211	0.733	37.24	124	Malawi	Sierra Leone^{+3}	Mozambique^{-1}	Centr. Afr. R.$^{-2}$
Uzbekistan	26,167	1998	463	0.588	50.07	125	Ethiopia	Uzbekistan^{-30}	Niger^{+1}	Burkina Faso^{-11}
Venezuela	26,577	9774	6052	0.666	52.49	126	Niger	Chad^{-16}	Burundi^{+3}	Burundi^{+3}
Vietnam	83,105	2100	1610	0.540	66.52	127	Sierra Leone	Zimbabwe^{+1}	Congo-D.Rep.$^{+3}$	Namibia^{-58}
Yemen	21,096	1976	1216	0.403	48.09	128	Zimbabwe	Congo^{-35}	Zimbabwe	Botswana^{-87}
Zambia	11,478	1089	913	0.360	27.18	129	Burundi	Burundi	-	Tanzania^{-17}
Zimbabwe	13,120	455	387	0.159	16.59	130	Congo-D.Rep.	Congo-D.Rep.	-	Zimbabwe^{-2}

All indicators are per capita (except population). In the country rank section, superscript indicates the change in rank order from GDP.

Sources: for population and GDP, World Bank (2013); for GDP^{e}, see the text; for the new HDI, UNDP (2010); for HPI, Abdallah *et al.* (2009).

Figure 1. Scatter correlations between GDP, GDP^e, new HDI and HPI for 130 countries, 2005



Sources: elaborations from table 1. For each pair, the fit line displayed is the highest one of linear, quadratic, or cubic.