

Green GDP Calculating

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Abstract

While the gross domestic product (GDP) index is a very dependable gauge of a country's economic performance, it nevertheless mainly ignores asset depreciation, non-market economies, and, most importantly, growth-related environmental harm. Economic growth that is environmentally sustainable has become one of the most critical pillars of long-term growth and development. In order to address many of the challenges associated with so-called green growth and sustainable development, I'm attempting to develop an alternative Green GDP indicator that will provide a clearer picture of the consequences of economic progress by introducing a new method of quantifying the cost of ecological and environmental degradation. The indicator examines economic growth through an environmental lens without speculating on how economic and social patterns will change in the future and how these changes may influence policy making. Although I recognize that this indicator cannot accurately reflect the true state and progress of national output, I regard it as an attempt to stimulate additional conversation on green growth in a variety of developing and established countries. As a result of the findings, a new synergy between economic and environmental concepts is required, and this study should be viewed as an opportunity rather than a barrier to equitable and sustainable progress.

Introduction

The GDP says nothing about the long-term viability or equity of growth and development. It ignores non-valued components of income distribution, asset depreciation, the non-market economy, and pollution, ecological degradation, and resource depletion as environmental challenges. It's much worse when we use it as a metric for comparing countries, because many countries attain growth through environmentally harmful means. As a result of the importance of economic costs of natural resource depletion and pollution, as well as damages to future growth and development prospects, a relatively new measure of growth, the so-called Green GDP, has emerged as a crucial component in assessing welfare and well-being. Green GDP is a new measure of economic growth that takes into account the environmental consequences of that growth, such as natural resource depletion and environmental deterioration.

The purpose of this research is to offer the results of a cross-country computation of an ecologically adjusted GDP measure in order to shed more light on the importance of green growth and sustainable development. As a result, we are attempting to develop an alternative Green GDP indicator that might provide a clearer picture of the effects of economic advancement by introducing a novel approach to estimating the cost of ecological and environmental damage. It will not only assess the true costs of environmental harm, but it will also consider some potential costs.

All the data used in the study are on a country level for the year 2014. A sample of 44 countries includes developing countries and developed countries

Literature Review

The amount of theoretical and empirical studies on the topic of Green GDP is not particularly impressive. We can anticipate that the empirical portion will be quite fascinating. This is true, owing to the fact that empirical studies approach the subject from several perspectives, each of which considers different lines of inquiry. To avoid an empirical stumbling block, I will only provide publications in this brief overview of the literature that are conceptually linked to the scope of our research, namely how to construct the Green GDP metric. Boyd (2006) provides an intriguing theoretical discussion in his study on non-market benefits of nature, where he evaluates two SEEA viewpoints on the quantification of benefits arising from environmental public goods. Despite the fact that the focus of this work was on service assessment, Boyd claimed that asset appraisal is entirely conceivable. And thus, despite SEEA's overconfidence in economists' abilities to account for ecological public goods, appropriate steps can be done right away to analyze what is socially useful about the common property resource. Rauch and Chi (2010) wrote an interesting paper about the difficulties that come with implementing Green GDP. Their examination of the framework's application resulted in the formulation of specific recommendations that could improve the resilience of sustainability accounting systems. The title of the paper, 'The Plight of Green GDP in China,' reflects its appeal, as does the conclusion that, despite initial failures, China may restart the development of Green GDP or environmental accounting. They stated that abandoning the nationwide adoption and usage of Green GDP might be a step forward for China and the global community, allowing more accurate and complete environmental data collecting and accounting, as well as more environmental valuation study. A great evaluation of the GDP vs. Green GDP dilemma was provided by Samuelson and Nordhaus (2014) who came to the conclusion that the

traditional GDP indicator was never meant to be an all-encompassing proxy for human well-being because it is only a partial measure that focuses on a society's material standard of life and how it evolves over time. As a result, the concept of GDP will continue to be valuable. However, because data gathering standards already exist, countries' environmental performance may be assessed and compared if they adhere to a better understanding of environmental and resource usage patterns, with Green GDP being one indicator that could help achieve that. See Qi, Xu, and Coggins (2001) for a more thorough systematization of the early theoretical and empirical contributions to this topic. Let us evaluate now some of the empirical studies.

Veklych and Shlapak (2013) used depletion of natural capital, environmental degradation owing to atmospheric pollution, and government spending on environmental protection to compute Green GDP and environmentally adjusted net domestic product for Ukraine (for the period 2001-2010). The basic finding was that Ukraine's economic growth is heavily reliant on natural capital and has major environmental consequences. Abdul Rahim and Noraida (2015) used an auto-regressive distributed lag (ARDL) bounds testing approach to investigate the short- and long-run causal link between Green GDP, traditional GDP, CO₂ emissions, trade openness, and urbanization in Malaysia (from 1971 to 2010). Aside from that, the study looked at the Green GDP and standard GDP forecasts from 2011 to 2050. According to the anticipated numbers, traditional GDP could expand at a faster rate than green GDP until both reach equal levels in 2045. Surprisingly, the Green GDP begins to dominate the regular GDP after that year. In this way, the writers implied that Malaysia is serious about executing its green policies so that the vision can be realized in the long run. Wang (2011) used Comparable Green GDP data from 31 provinces and regions to run a variant of the Solow-growth model to examine the effects

of international trade openness at the provincial level in China. The key finding was that at the provincial level, there appears to be a non-linear link between Green GDP and openness, as assessed by trade volume and foreign direct investment. This conclusion is consistent with Talberth and Bohara's (2006) findings at the national level.

The work by Qi, Xu, and Coggins is the most interesting for our research because it is the only complete and exhaustive examination of Green GDP on a cross-country basis. For a sample of 103 developed and developing nations, the authors computed the value of environmental damage as a percentage of GDP and Green GDP (for the period 1980-1997). They concluded that the global value of environmental externalities per unit of GDP grew between 1980 and 1983 on behalf of environmental damages. It suggests that, in some way, environmental quality has been sacrificed to GDP growth over this time. However, since 1992, the world's environmental externalities for creating one unit of GDP have progressively decreased. They calculated the Green GDP indicator by nation in three years (1980, 1992, and 1997) and found that the growth of GDP and Green GDP were nearly identical in almost all countries, however the growth rates were on various scales in terms of developing vs. developed countries. Even if we include countries in their early stages of growth, the authors determined that most countries have not harmed their environmental quality in order to attain GDP gains. Because the results of this study (in terms of the time period studied) are now more than 20 years old, it will be fascinating to see what the results would be today.

Methodology

I analyzed both quantitative and qualitative features that a reliable and comprehensive indicator on a cross-country scale should contain in order to establish an alternate method to Green GDP measurement. I employed a universal methodological methodology that is suited for assessing and comparing other countries, as well as other surveys, in order to maintain the common Green GDP accounting framework (a quantitative stance). As a result, the Green GDP indicator is computed by subtracting the cost of natural resource consumption from the cost of environmental degradation. The index is derived based on data obtained from officially recognized international sources, such as the World Bank, to ensure a high degree of objectivity. Furthermore, the indicator is provided as a growth rate, which makes it easy to compare to the traditional GDP measure and to make a numerical comparison between countries. On the other hand, I've taken into account the relevance of economic variables that aren't well reflected in standard GDP measures, or even in various 'green growth' methodologies. Specifically, our methodology (a qualitative position) incorporates supplemental data by discriminating between the true costs of environmental damage and the easy-to-calculate opportunity costs of a missed turnover. In this way, I'm actually addressing some aspects of societal costs.

The idea is to develop a single monetary measurable indication that is understandable to the general public and can be easily linked to standard GDP data, akin to the Green GDP concept. My methodology provides a flexible framework that may be expanded over time to include new characteristics, reflecting rising data availability and new political, social, and economic issues, as well as cross-national and regional comparability.

The methodology's flaws are mostly connected to the standard issues that arise when valuing environmental damage in monetary terms. Some techniques of assigning monetary values are arbitrary, and data availability and dependability continue to be a difficulty for many countries, particularly developing ones, because the required data can have limited coverage, measurement mistakes, and biases. At the same time, it may be criticized for failing to take into account other human and societal factors, as well as natural factors such as development expenditures for environmental protection. However, I regard it as an attempt that might still serve as a solid model for creating and refining a new indication that will pique public interest. Thus, a general scheme of calculation is

$$\text{Green GDP} = \text{GDP} - (\text{CO}_2 \text{ emissions in kt} \times \text{total CDM in average prices for kt}) - (\text{t of waste} \times 74 \text{ kWh of electrical energy} \times \text{price for 1 kWh of electrical energy}) - (\text{GNI}/100 \times \text{natural resources depletion \% of GNI})$$

where the first deduction represents CO₂ pollution costs (as CO₂ emissions times carbon market price), the second represents the opportunity costs of one tones of waste that could be used in the production of electrical energy, and the third represents the adjusted savings of natural resource depletion as a percentage of gross national income per country.

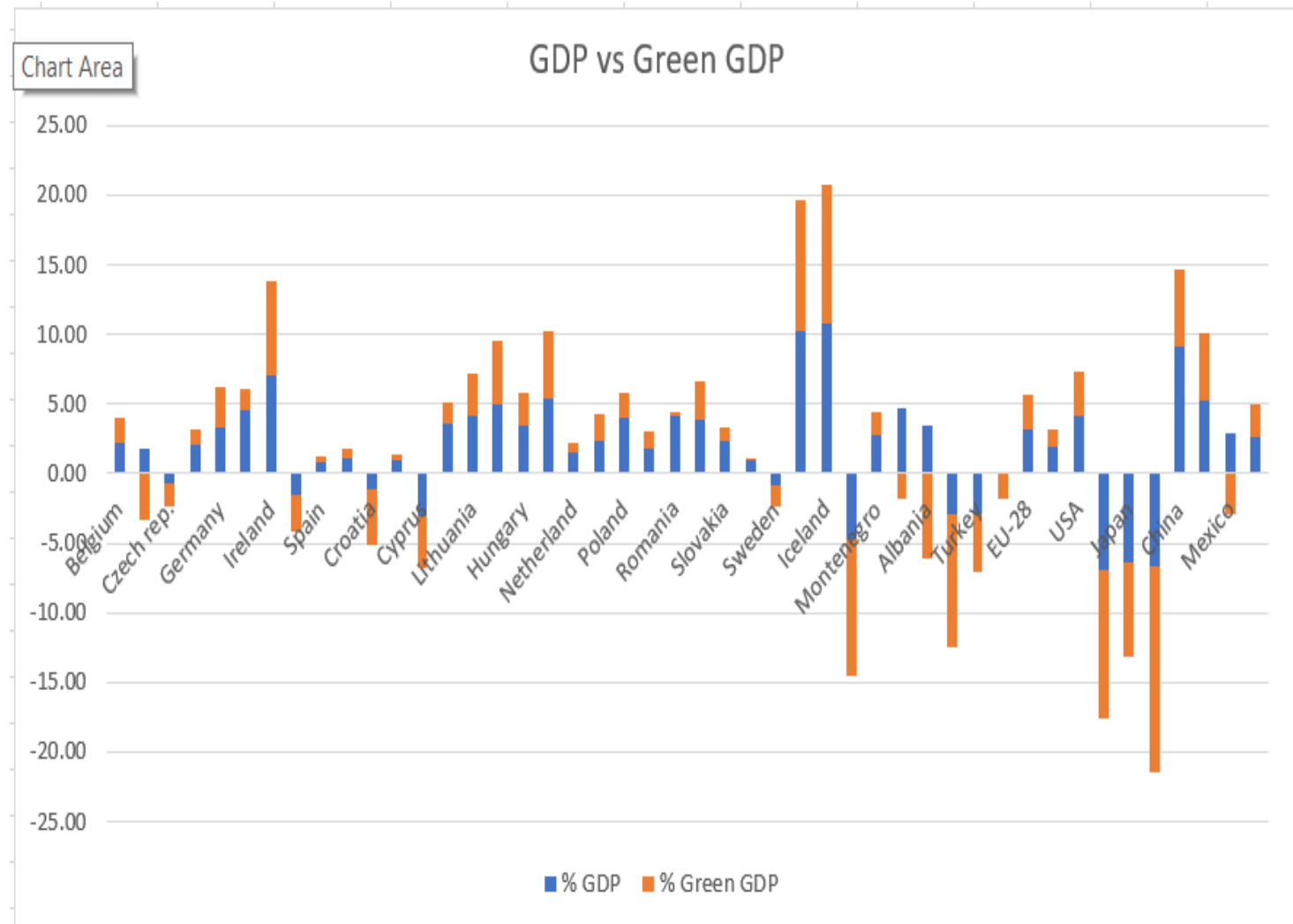
Data

Data for a sample of 44 nations was gathered from Eurostat and the World Bank's World Development Indicators (WDI) database, which includes both developing and developed countries (with some specific indices from other sources; see Appendix). For the year 2014, the sample includes 44 nations (EU countries and potential members, part of the OECD countries, and certain chosen countries, as well as two specialized regions: EU-28 total and Euro area total). Data (un)availability is a key impediment to conducting more broad cross-country research because most data on, for example, CO₂ emissions (released biennially by WDI) or tones of garbage (issued every five years by Eurostat) is published sporadically.

As a result, this is a somewhat static signal, but one that may be published on a regular basis. Nonetheless, all data are extensively examined, assembled, and confirmed in order to establish acceptable robustness and integrity, as well as compatibility of the Green GDP indicator across countries. Finally, both the regular GDP statistic and the Green GDP derived from it are expressed in current US dollars.

GDP (in PPP) was obtained as the sum of gross value added by all resident producers in one economy plus any product taxes minus any subsidies not included in the value of the products. It has been calculated without making deductions for depreciation of fabricated assets or depletion and degradation of natural resources. Carbon dioxide emissions are expressed as kilotonnes and were obtained from the same source. Total CDM in average prices for kilotonne, is a carbon market price. Total commercial and industrial waste is presented in tonnes and data were partially collected from the Eurostat and from the World Bank database. In order to evaluate opportunity costs related to waste problems, knowing that the amount of waste nations produce annually is huge, we introduced

a waste-to-energy conversion principle. Hence, kilowatts of energy in one tonne of waste present an amount of electrical energy that can be obtained from a waste\$. The price for 1 kilowatt-hour is calculated as a mean of commercial and industrial price for each country. Gross national income or GNI is the sum of value added by all resident producers plus any product taxes not included in the valuation of output plus net receipts of primary income (compensation of employees and property income) from abroad (WDI, 2017). Finally, variable adjusted savings of natural resource depletion, as a percentage of the GNI per country, presents natural resource depletion as a sum of net forest depletion, energy depletion, and mineral depletion.



Result

For the nations studied, we give a detailed breakdown of the discrepancies between traditional GDP annual growth rates and computed Green GDP annual growth rates for the year 2014. (Refer Excel File). We will also assess other categorizations of nations, such as developed countries vs. developing countries, ex-communist countries, Euro area countries vs. EU-28 countries, and so on, to ensure robustness within the comparison. In 2014, GDP growth rates for the entire sample ranged from -6.99 percent (Australia) to 10.79 percent (Iceland), while environmentally corrected GDP, or Green GDP, values ranged from -14.83 percent (Chile) to 9.94 percent (Iceland). While the average GDP growth rate for all countries was 1.92 percent, we have negative numbers for Green GDP growth of -0.06 percent, implying a discrepancy of nearly 2 percent. This means that in terms of economic development, these countries' growth in 2014 was insufficient. Belgium (0.51 percent), Germany (0.57 percent), Ireland (0.35 percent), Spain (0.46 percent), France (0.39 percent), Italy (0.45 percent), Luxemburg (0.40 percent), Austria (0.47 percent), Portugal (0.49 percent), Japan (0.46 percent), Israel (0.51 percent), and Switzerland (0.51 percent) had the best results and thus the smallest difference (0.60%) between GDP and Green GDP growth (0.18 percent). Bulgaria (5.08 percent), Norway (5.20 percent), Macedonia (6.42 percent), Albania (9.60 percent), Serbia (6.77 percent), Chile (8.21 percent), and Mexico had the worst results in terms of discrepancies (>5.00 percent) (5.79 percent).

Following that, we can classify countries into three categories: developed countries (Belgium, Denmark, Germany, Ireland, Greece, Spain, France,

Italy, Cyprus, Luxemburg, Malta, Netherlands, Austria, Portugal, Finland, Sweden, UK, Iceland, Norway, USA, Australia, Japan, Israel, Switzerland), developing countries (Bulgaria, Czech Republic, Estonia, Croatia, Latvia, Lithuania, Hungary, Poland, Romania, Slovenia, Slovakia, Montenegro, Serbia, Turkey, Moldova, Chile, China.

The sample was chosen at random, but when compared to other similar groups, the results will reveal their consistency. The average GDP growth and Green GDP growth for developed countries were 1.85 percent and 0.92 percent (difference 0.93 percent), 1.78 percent and -1.15 percent (difference 2.93 percent), and 4.03 percent and -3.98 percent (difference 8.01 percent) for developing countries and underdeveloped countries, respectively. This means that environmental quality and the economic development process improve with development stages, or, on the other side, that countries in lower development stages choose higher (present) growth rates over long-term human-social-natural growth and development. When looking at the findings for the EU countries, one may see a direct argument for such a conclusion. For the EU-28, average GDP growth and Green GDP growth were 3.16 percent and 2.56 percent, respectively (a difference of only 0.60 percent), and 1.93 percent and 1.30 percent, respectively (a difference of only 0.63 percent) for Euro area nations. We may conclude that the most satisfied countries, measured by the smallest difference in GDP vs. Green GDP growth, come from one of the world's most developed regions, the EU. We'll be able to corroborate some of the prior findings with more systematization.

Conclusion

The findings reveal that in 2014, the growth rates of GDP and Green GDP differed significantly in virtually all nations, equally between countries in the same groupings and between different categories of countries. We discovered that in industrialized countries, the gap between average GDP growth and Green GDP growth is around 1%. When emerging countries are taken into account, the disparity is considerably greater. It is estimated to be around 3%. When we concentrate on developing countries, the disparity becomes tremendous. Surprisingly, the EU-28's average GDP growth and Green GDP growth were 3.16 percent and 2.56 percent (a difference of only 0.60 percent), respectively, and 1.93 percent and 1.30 percent (a difference of only 0.63 percent) for Euro area nations. In general, developed European countries, such as Israel and Japan, had the smallest difference between these two measures, while developing countries, such as Albania, Bulgaria, Serbia, Chile, and Mexico, had the largest. China is often used as an example of (apparent) lack of environmental consciousness, but we observed a rather consistent outcome, similar to that of other developing countries. Finally, I would like to state that in 2014, the majority of countries' environmental quality was sacrificed in order to obtain faster growth rates and standard economic gains.

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