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Research on the Application of GGDP Model in Developing Country

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Abstract: Green Gross Domestic Product (GGDP) refers to the environmentally adjusted gross domestic product (GDP) after deducting the consumption of natural capital from the GDP. This article analyzes the advantages and disadvantages caused by replacing GDP with GGDP. From the perspective of developing countries, China is chose as an example. Then logistic regression model is used to analyze the current development situation and compare whether the changes after GGDP application can reach a satisfactory value. Finally, the article analyzes the forecast results and evaluate that the use of GGDP has brought positive benefits to the global climate.

The results show that the model runs well and has high credibility, and can be used to promote the coordinated development of economy and environment.

Keywords: GGDP Prediction; Global Climate Change; Natural Resources; Green Economy

1. Introduction

Gross Domestic Product (GDP) is the core indicator of national economic accounting and an important measure of the economic situation and level of development of a country or region.This method of calculating such an important and often cited indicator favors production today, without taking into account the conservation of resources for tomorrow. Since GDP does not take into account natural resources, perhaps it is not a good measure of a country's true economic health. The concept of Green GDP has been proposed, where "green" means that environmental and sustainability perspectives and factors are included. The multilateral change is extremely challenging and convincing countries to agree to adopt the new GGDP rather than the traditional GDP as the primary measure of economic health can be very difficult through the background of the research. This issue would focus on the impact of the GGDP on climate mitigation and the strong link between GDP and GGDP.

2. GGDP Strategy's Projected Effects

2.1 Logistic regression model

The logistic regression model can be used to determine whether it is worthwhile to use GGDP globally. The logistic regression function of our GGDP strategy is

$$f(x) = \frac{1}{1 + e^{-(\sum_i^n = 1^{3.25x_i + 81.21)}}}$$

According to the basic rules of logistic regression model, if 0<H<0.5, it is believed that it is not worthwhile to use GGDP strategy, and if 0.5<H<1, and the change is good. Through calculation, it can be observed that the value density distribution is between 0.5 and 1, so the conclusion is that the change is worthwhile.

2.2 Projected benefits from GGDP strategy

The contradiction of the problem lies in the dialectical relationship between economic development and environment, which can be analyzed from the perspective of developing countries. China is chosen as an example. Because the GDP growth rate of developing countries is relatively fast, the change trend can be obtained through historical data, and a benign growth rate needs to be maintained in the future. Then, the application of GGDP will inevitably lead to a decline in growth rate or GGDP.

Based on the available data, it fits the GDP trends of China.

According to our forecast of GDP of China (a developing country) in the next ten years, the analysis can be made on a global scale. After using GGDP, the benefit is that the environment will become better in the next few years, while the damage is that the GDP will decline in recent years. From the prediction result, it is obvious that climate change is inversely proportional to GDP but positively proportional to GGDP. The use of GGDP is bound to bring about economic decline, that is, a decrease in GDP, while an increase in environmental benefits. Accordingly, the cost of environmental loss and ecological damage will be reduced. If GGDP is adopted, GGDP stands for sustainable development, which means green should be developed, and green development can reduce emissions of carbon dioxide and other greenhouse gases, and no longer make the earth's internal temperature rise;

Reduce the emission of some harmful gases, let the air more pure; Industrial manufacturing began to reduce carbon, the implementation of continuous cycle. All these will affect our calculation of GGDP. Pursuing GGDP, rather than simply focusing on the pursuit of economy, can effectively prevent the continuous rise of global climate and keep the temperature inside the earth at a stable temperature suitable for human survival.

Finally, the projections need to be analyzed and the impact of GGDP use on global climate assessed. Methods such as statistical analysis, risk assessment and decision analysis can be used to assess and manage climate change and environmental impacts. At the same time, it is necessary to consider uncertainty factors, such as the uncertainty of climate variables and economic growth, so as to assess the impact of the use of GGDP on global climate more comprehensively and accurately.

3. Apply Model

3.1 Predictions based on the apply model

China is chose as our model application, and make a specific analysis of the transformation of GGDP based on the collected data. A linear regression model is built and add multiple independent variables to the study.

Considering that China's current economic status and its ability to provide for future generations are related to environmental changes, the loss of mineral resources is collected as the independent variable, and the dependent variable was GDP-GGDP, so as to conduct regression analysis.

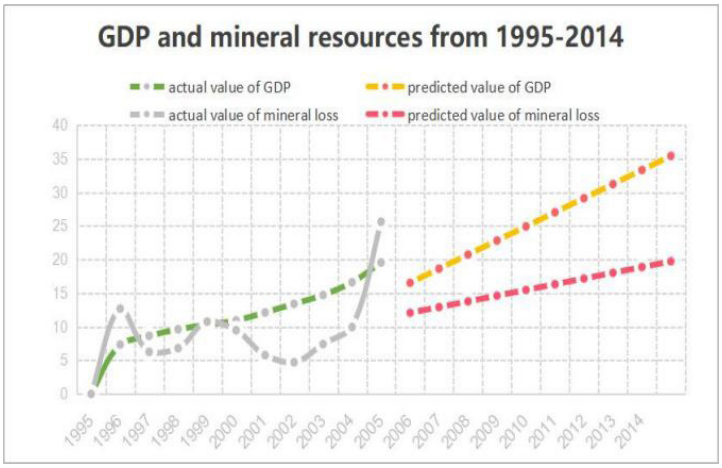

Figure1: GDP and mineral resources from 1995-2014

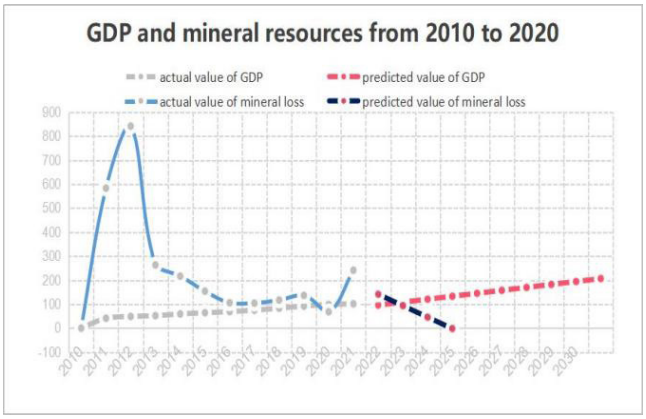

Figure2: GDP and mineral resources from 2010 to 2020

3.2 Analysis of the Result

The above two figures respectively show the change of mineral resource consumption before and after China switched to GGDP. From the comparison of the above two figures, it can be clearly seen that the consumption of mineral resources will be less with the longer the use of GGDP, which can also ensure the increase of per capita disposable income and population density. In other words, under China's current economic status and ability to provide for future generations, green GDP is beneficial to China's development. China's massive use of mineral resources from the beginning to the later conservation of mineral resources can further reflect that under the GGDP system, China and even the countries that use GGDP on the whole earth are conserving the use of natural resources, which provides sustainability for the national economic development and the ability to support future generations. Even if the GDP growth rate is relatively slow, the use of GGDP is beneficial to the country from the macro level under the current national basis. Slowing down the use of natural resources is beneficial to the long-term development of the country and even the earth. With the change of time, the correlation between natural resources and GDP growth weakens, which further confirms that under the GGDP system, it can find green and environmentally friendly new energy to replace natural resources and contribute value to GDP growth. Natural resources are limited and slowing down the use of natural resources is not having a huge impact on the economy but providing sustainability for future generations.

Therefore, the promotion and use of GGDP model should be supported.

4. Sensitivity Analysis and Error Analysis

4.1 Sensitivity Analysis

When fitting the GDP curves of China , in order to explore the accuracy of the model, we investigated the confidence interval for the fitting results. The shorter the values between confidence intervals, the shorter the interval and the narrower the spacing. And the numbers are close to the average of the population.

From the fitting data of China, it can be seen that the 95% confidence interval is between 57.5076 and 85.0906, which means that the values of the two groups of data are close to the mean value of the overall value. The upper limit and lower limit here refer to the error range, indicating that the error value of data will not exceed the upper and lower limits, and the error value of data will always exist and cannot be avoided. According to the fitting curve and fitting confidence interval, the data obtained are relatively accurate and reliable, and the accuracy of the model is high.

4.2 Error Analysis

year	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
energy loss/percentage of GNI	1.524331	1.58221	1.25444	0.654148	0.952203	1.732527	1.514014	1.163785	1.202828	2.66424

Table 1 The percentage of energy consumption in GNI in 1995

year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
energy loss/percentage of GNI	2.488825	3.153318	2.027168	1.510246	1.184051	0.555229	0.460356	0.585339	0.718382	0.584465	0.432348

Table 2 The percentage of energy consumption in GNI from 2010 to 2020

We used real China's total energy consumption data over the years to predict the impact of GGDP application on energy consumption.

The table 1 is the percentage of energy consumption in GNI in 1995, 2004, before the implementation of GGDP, and the table 2 is the percentage of energy consumption in GNI from 2010 to 2020 predicted by us according to the above model, after the implementation of GGDP. This indicates that before the implementation, China's energy consumption was increasing year by year, but after the implementation, the overall energy consumption began to decrease.

Conclusion

The logic regression model is used to judge that GGDP is worthy of being used as a standard to measure economic health on a global scale. Considering that China's economic situation and its ability to provide for future generations are related to environmental change, through regression analysis, it is found that China's conversion to GGDP has not brought great impact on the economy, but provided sustainability for future generations. Therefore, the promotion and application of GGDP should be supported. Finally, it points out the benefits of China's application of GGDP through non-technical reports and gives reasonable policy suggestions.

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