A Review of Road Transportation Value Added and CO₂ Emission in Iran

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Abstract

Relationship between development level of countries and the achievement of environmental standards has been focused by researchers. In the late 20th century and at the beginning of 21st century, the view to resolving society problems and economy was almost changed and sustainable economic development was considered beside economic growth rate. This paper aims to measure the impact of value added of transportation on environmental. Regarding to completion or destruction of natural resources, Mineral resources and other environmental issues we would able to evaluate the economic activity. In order to find the main factor that can affect on CO₂ emission, this paper has applied the population, number of cars and road transportation value added. Since all coefficients are statistically significant, therefore we conclude that there is a positive relationship between CO₂ emission and other independent variables such as; road transportation value added and population.

Keywords: Number of Cars, Environment, Road Transportation Value Added, Emission of CO₂, Changes in Population

1. Introduction

Following to industrialization of western countries, developing countries especially Asia follow to increase investment and foreign direct investment in order to increase economic growth. So they have followed economic plan and production growth in different economic sectors in the form of five-year plan at their agenda. In some cases, economic reforms, decentralization, attracting direct foreign investment and economic growth around 8% are put in goals. Therefore,
these countries generally focus their five-year operation as well as yearly operation on GDP [8].

During last three decades, growth rate of economic and its negative effects on environment is an interesting issue. So in this period, poverty, inequality and environment destruction were of the most problem dealing with economists. As a result of this, the UN millennium statement containing Millennium Development Goals (MDG), was addressed by the UN in 1990s and many countries agreed, so it made them to try more to solve the poverty issue and sustainability of the environment [13]. Recently United Nations is going to shift from MDG to Sustainable Development Goals (SDG). At the United Nations Sustainable Development Summit on 25 September 2015, world leaders adopted the 2030 Agenda for Sustainable Development, which includes a set of 17 Sustainable Development Goals (SDGs) to end poverty, fight inequality and injustice, and tackle climate change by 2030[14].

2. Objectives

In recent world beside the economic growth, other economic indicators must be considered for measuring the development level. Although economic growth is considered as an index for measuring the development level, other indicators such as environments indicators must be considered as sustainable development indicators. The main objective of this paper is the study of the impact of transportation value added and the number of cars on CO₂ emission in Iran.

3. Literature Review

Sustainable economic development can be studied by making the relationship between system of national accounting and environmental statistics. Traditional measurement of GDP and its growth cannot specially consider as an index for sustainable development and there is a lot of criticism on it. Although one of the measurement instruments for success and economic operation of each society is undoubtedly GDP that shows the economical operation of the society in fiscal year, it does not show the economical welfare that is according to the sustainable development and environmental considerations. The concept of green GDP that was provided around 1990, was in reply to the weakness and lack of the current method in measuring GDP in providing economic costs due to decrease and distortion of natural resources, pollution increase and negative effects on human health [11], [12].

3.1. Value Added and its limitations

In accordance with the system of national accounts and its general methods, monetary value of all new services and goods that are produced in one fiscal year in geographical area on a country is named GDP. In order to calculate the GDP, one approach is measuring the value added of all economic sectors. But this tradition-
nal way according to the national accounting method has some weak points that we summarize them below.
- Traditional GDP does not consider the income distribution as well as how the benefits of economic growth distribute within the individuals and who these individuals are.
- GDP has some weak points and problems in calculating the activities of individuals who works in the house or their goods do not pass the official ports and market.
- There is no difference between activities that has positive effect on welfare and those that has negative effect on it in calculating GDP or if there are any, they are not measurable. Its classic example is oil extraction and its meeting that increase GDP from one side but has environmental risks from the other side that GDP neglects them.
- Traditional GDP cannot reflect the true human welfare since its numbers and accounts are for survival of the society via current consumption and do not show the decrease of natural resources and stores for the future generations [2] In accordance with the abovementioned matters, this subject is totally agreed that traditional GDP has some weak points and problems since it does not consider the nature role in human welfare and achievement to the sustainable development significantly. Today the subject of exact estimation of the missing costs like damages to the natural resources and environmental pollution should be considered in national accounts and lead to green GDP.

3.2. Some Performed Studies

The concepts and definition of GDP calculation was resulted in some occasions in the role of public science and politics in 1990. One of the most important and highlighted attempts to realize Green GDP was done by China Republic. In 2006, the state of China discussed environment friendly GDP through Environmental Protection Organization and Statics National Office. A report offered by these organizations shows that the loss of economic impact on the environment will reach to 3 percent of China’s GDP in 2004. But, the main and key problem in the calculation method still has been unsolved. For example, only half of the costs of 20 types of pollution in China were more than the amount of predicted Green GDP in this country [15]. The results of researches about the relationship among economic growth, trade liberalization and, environmental quality show that there is uniform relationship between economic growth and the emission of carbon dioxide [4] [7]. Another study shows that open economic reverses environment destruction process by promotion of technology and its impact on the productivity. The experiences of industrial countries show that there is a relation between economic growth and environment in such a manner that in some of these countries there is an indirect relationship relative to energy consumption and gross domestic production [16]. Another study that has been done in Iran speaks of the impact of economic openness degree on the environment destruction in long term. The results have shown that the emission of carbon dioxide have destructive influence on the environment, positively and at
The study of economic growth rate, growth rate of energy consumption and CO\(_2\) show that there is a positive relationship between these variables in Iran. On the other hand CO\(_2\) emission is increasing while energy consumption growth increases [2].

4. Data and Methodology

This section deals with the Procedure, Data Definition of Variables and Methodology. This Paper has applied data and information from the statistical center of Iran [9],[10] and balance sheet of energy from energy ministry of Iran [6]. After more consideration and using from the related function, the best one has been chosen for proper model. The model which has been applied is as follows:

\[
\text{CO}_2 = f(\text{TRV},\text{POP}) \quad \text{so:}
\]

\[
\text{CO}_2 = A \text{TRV}^\alpha \text{POP}^\beta 
\]

\[
\ln \text{CO}_2 = \ln A + \alpha \ln \text{TRV} + \beta \ln \text{POP} 
\]

where:

\(\text{CO}_2\) is carbon dioxide as dependent variable, TRV and POP indicate the value added of road transportation and population as independent variables respectively. The equation (1) is Cobb-Douglas Production Function so that \(\alpha\) and \(\beta\) are the output elasticity of transportation value added and population, respectively. Equation (2) shows the transformation of equation (1) by taking Natural Logarithms. The transformation of these variables by taking logarithms has several advantages [3]: First, the production function is not linear. Second, estimated coefficient can be directly interpreted as elasticity. Third, the first difference of natural logs represents a robust method of calculating percent changes. Fourth, during least squares regression the Logarithmic transformation eliminates possible problems of scale in the inversion of the covariance matrix [5].

5. Results and Conclusion

The present section intends to answer the question which is introduced in objectives. That is the study of the impact of transportation value added and the number of cars on CO\(_2\) emission in Iran.
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Figure 1: Changes in Population and Cars (unit, Person and Numbers)

![Figure 1: Changes in Population and Cars](image)

Source: Author processing of SCI data

Figure 2: Changes in Road Transportation Value Added and CO₂ Changes

![Figure 2: Changes in Road Transportation Value Added and CO₂ Changes](image)

Source: Author processing of SCI data

Figure 1 indicates the changes in population and number of cars in Iran. It shows that there is a uniform relationship between these variables. Figure 2 illustrates the trend of changes in transportation value added and changes in CO₂ emission in Iran during 1996-2013. The left side of figure 2 indicates the changes in value added of road transportation in Billion Rials at Constant Price 1997, and right side of figure shows the changes in CO₂ in thousands tons. A study on CO₂ emission shows that the highest change happened in 2007; and also this figure has shown that there is a uniform relationship between value added of road transportation and carbon dioxide.
Finally this paper has presented the estimated coefficients of equation 2 as follows:

\[
\ln \text{CO}_2 = 0.6836 \ln \text{TRV} + 0.7117 \ln \text{POP} \tag{3}
\]

(16.59) (30.95) \quad R^2 = 0.969

The value in bracket shows t-value. Since t-value is obtained greater than 2, so we reject null hypothesis. In addition R-squared is obtained 0.969, therefore we conclude that all coefficients are statistically significant. The resulting regression in equation 3 shows that there is a positive relationship between CO\(_2\) emission and other independent variables such as; road transportation value added and population.

References


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Annex:

Dependent Variable: LCO2
Method: Least Squares
Date: 09/21/15  Time: 18:07
Sample (adjusted): 1996 2012
Included observations: 17 after adjustments

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
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<tbody>
<tr>
<td>LPOP</td>
<td>0.711734</td>
<td>0.022989</td>
<td>30.95912</td>
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<td>LTRV</td>
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<td>0.041203</td>
<td>16.59085</td>
<td>0.0000</td>
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</tbody>
</table>

R-squared 0.969970  Mean dependent var 19.71173
Adjusted R-squared 0.967968  S.D. dependent var 0.341755
S.E. of regression 0.061165  Akaike info criterion -2.640346
Sum squared res. 0.061118  Schwarz criterion -2.542321
Log likelihood 24.44294  Hannan-Quinn criter. -2.630602
Durbin-Watson stat 1.126138

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