Review

Influencing factors on carbon emissions in China transport industry. A new evidence from quantile regression analysis

Boqiang Lin [a, *], Nelson I. Benjamin [b]

[a] Collaborative Innovation Center for Energy Economics and Energy Policy, China Institute for Studies in Energy Policy, School of Management, Xiamen University, Fujian, 361005, PR China
[b] The School of Economics, China Center for Energy Economics Research, Xiamen University, Xiamen, Fujian, 361005, PR China

ABSTRACT

This research examines the impact of GDP per capita (gross domestic product), energy intensity (EI), carbon intensity (CI), and total population on carbon dioxide emissions in China's transport industry using quantile analysis from 1980 to 2010. Obviously the study on carbon dioxide has garnered attention globally due to climate change and its relation to green house gas emissions and several other factors, and considering the alarming pace of industrialization and urbanization in China which has led to rapid economic growth and high energy consumption. Also, the percentage of oil consumption to total oil demand in the transport industry of China was 38.2% for the year 2010 which has significantly raised the emission level of carbon dioxide. In this study, having confirmed stationarity and that there exist a long term relationship among our variables (carbon emission, gross domestic product, energy intensity, carbon intensity, and urbanization), we checked which variable(s) has a greater impact on carbon emission on different quantiles. Our quantile estimates showed how the effects of the independent variables (gross domestic product, energy intensity, carbon intensity, and urbanization) varies across the levels of the dependent variable (carbon emission), the results showed that these effect are not constant across the spectrum of the dependent variable. Unlike the gross domestic product, energy intensity, carbon intensity, and urbanization had an inconsistent effects across the spectrum of carbon emissions. All variables were statistically significant in all the spectrum of carbon emissions except for urbanization, which was only significant at the tail ends of the distribution (urbanization was only significant at 10th percentile and 90th percentile respectively). The results therefore shows clearly that GDP, energy intensity, carbon intensity has a greater impact on carbon emission than urbanization, this makes sense to an extent in real life comparing the fact that China is still in the process of urbanization, so not all cities are urban for now. However, this shows that where urbanization exist, it can influence carbon emissions alongside other factors immensely.

© 2017 Elsevier Ltd. All rights reserved.

Contents

* Corresponding author. Collaborative Innovation Center for Energy Economics and Energy Policy, China Institute for Studies in Energy Policy, School of Management, Xiamen University, Fujian, 361005, PR China.
E-mail addresses: bqlin@xmu.edu.cn, bqlin2004@vip.sina.com (B. Lin), saintbenign@yahoo.com (N.I. Benjamin).

1. Introduction

China is urbanizing at amazing pace, in thirty five years, more than 500 million people have been added to cities, and we can argue that this is dependent upon incessant economic growth which has led to high pace of urbanization that has raised standard of living in China, acknowledging that as cities become bigger, its economic output increases. China has grown tremendously from a nation of subsistence farmers at the end of the 1970's into the world's second largest economy behind the United States of America as she opened her economic borders to the rest of the world, the costs to environment associated with such change are often noticeable and very hard to conceal or contained to a barest acceptable minimum. As a result of economic boom in the country, all cities in China are no longer characterized by bicycles or tricycles but cars, travelling is a lot faster from one end of the country to the other end even as the government continues to implement different policies to ensure that all areas are connected and easily accessible, this might have created smog in densely populated areas like Beijing. Due to mass rural migration to urban areas for the pursuit of "the Chinese dream", more people live in the city, buy air conditioners and other related energy consuming home electronics and accessory and depleting more energy for transportation, and judging by its population and other factors, has made China to surpass the United States of America as the number one carbon emitter roughly six years ago and this gap is huge and widening except drastic measure is taken to curb it. It will be recalled that when developed countries around the world in 1997 agreed to limit their greenhouse gas emissions, China and other developing countries were excluded and in order to keep pace with the rapid expansion of all sectors in the economy, China was harnessing about seventy percent of its energy from coal to sustain her economic growth rate, and because of rapid urbanization it also became the world leader in the production of cement, a process that also causes greenhouse emissions. In the year 2009, China accounted for 23.7 percent of 28,999 Mt CO_2 emission of the world, as against 5.7 percent of a total of 15.624 Mt Co_2 of global emissions in the year 1973 (IEA, 2011). The CO_2 emissions by the transport industry also accounted for about 10 percent of the total final energy consumption in the year 2008, and the share of this industry energy consumption from the energy consumption of China and China's total energy consumption is approximately 10.4 percent and 15.9 percent respectively. Also, in the year 2010, China's carbon emission was estimated to be around 8332.5 Mt representing 25.1 percent of the world's total emission (IEA, 2011).

In the last three decades, carbon emissions has garnered interest globally due to sporadic changes in climatic conditions and its effect on environment and a careful observation of the emission trend from China reveal that a strong commitment is needed from China for the mitigation of carbon emission and China should try to reduce and curb its carbon emissions from its dominant energy sources. The significant of Chinese transport industry cannot be over emphasized because it is the cornerstone for its economic boom as China continues in its drive for industrialization and urbanization (China is the world's industry and the most populated country in the world). The analysis of carbon emission factors in transport industry is indispensable taking into consideration the rapid evolvement of Chinese modern transportation systems as it aids civilization even though it has been proven that this industry will be the highest contributor of carbon emissions that will enhance global warming in the near future (Lim and Lee, 2012). However this industry is no doubt a vital sector for globalization with meaningful contribution to economic growth and a betterment in day to day activities (Ong et al., 2012), from a global view point of analysis the energy consumption of transport industry is almost one third of the world's total energy consumption and this sector is also the second largest energy consuming sector only after the industrial sector and it accounts for 30 percent of the world's total energy (Atabani et al., 2011). It is an unarguable fact that the transport industry is a major player in fossil fuel depletion, environmental degradation, and hazardous to human health where it accelerates its deterioration (Alexandros et al., 2009). These reasons and more like it makes the research in this sector a worthy course of action so as to achieve and maximize its energy saving potential and all available possibilities in carbon emission reductions on target factors (Wang et al., 2014), which is in accordance with the global concern on energy and environmental issues and in line with a sustainable development. These have made energy efficiency and environmental performance evaluation rigorous and important, and China is at the forefront on this because the government presented an 11th Five-year plan where a reversal for the increasing trend in energy intensity was unveiled and demanding that energy intensity must be reduced by more than 20 percent in the next five years. Also the Chinese government ushered in stricter policy guidelines on energy conservation and efficient use with an increased energy conservation efforts.

The motivation of this research is to see if there exist a long-run relationship among chosen variables and to investigate the extent of influence each variable has on the carbon emission in China's transport industry on different quantiles. Previous researches used Kaya identity and carbon emissions in China's transport industry was decomposed into gross domestic product, carbon intensity, energy intensity, and population, few studies replaced the total population in the Kaya identity with urbanization rate considering the current development characteristics of China. We intend using the latter approach to study some influencing factors in China's