

Estimating the economic cost of emission reduction in Chinese vehicle industry based on multi-objective programming

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Received: 15 February 2012 / Accepted: 31 October 2012 / Published online: 19 December 2012
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Abstract By enforcing emission reduction policies, the economic effects on different industry are quite diverse. Scientific estimation for this kind of effect has important realistic meaning for the industry development. A multi-objective programming approach integrated with input–output analysis model is used in this paper to evaluate the impact of emission reduction policy on the cost of reducing gas emissions and undertaking industrial adjustment in Chinese vehicle industry. The empirical results show that gas emission control has positive influence on vehicle industry production value. But, this influence is lower than the average macro-economic cost of CO₂ emission in China. These policy implications on vehicle industry are less serious than other high emission industries and, at the same time, the enforcement of reduction policy is a chance for new energy vehicle development.

Keywords Emission reduction · Vehicle industry · Multi-objective programming · Economic cost

Introduction

From 2008 to 2010, due to the global financial crisis, Chinese vehicle industry reduced the vehicle purchase tax to

passenger cars of 1.6 l and below engine capacity model, which were referenced to the policies of foreign countries to encourage the consumption of small cars to achieve carbon reduction method. These kinds of policies were aimed at industry structure adjustment, industry growth maintenance, industry energy consumption controlling, and air pollution controlling. Thus, under the stimulus of these policies, Chinese vehicle industry showed high growth rate. In 2009, car sales growth rate was more than 46 % year-on-year, and the growth rate was about 32 % in 2010. Also, with the increasing of economic development in China, vehicle industry met a rapid development period. Based the report from The Associated Press, China's monthly vehicle sales surpassed those in the United States for the first time in January 2009, moving China closer to becoming the world's biggest auto market. After 2010, with the cancelation of the vehicle purchase tax preferential policies, most of the small displacement cars which are 1.6 l and below vehicle models were no longer enjoy the subsidy. On the other hand, under the purchase limitation policy, many consumers could only buy a car by original vehicle replacement. In this case, most consumers inclined to choose large engine capacity vehicle models. Then, in the year of preferential policies cancelation, the sale of 1.6 l and below vehicle models decreased of 61.5 % compared to the same period of 2010. The trade share of 1.6 l and below domestic cars in 2011 even decrease to 26.8 % from 50 % in 2010.

In Copenhagen Climate Council, China committed to reduce its carbon dioxide emissions per unit of GDP by 40–45 % from 2005 levels and use non-fossil fuels for about 15 % of its energy by 2020. At the same time, road carrying capacity in China's large cities is closing to reach them limit with the increasing car use and urban air pollution. Studies (2011) have shown that vehicle gas emission has taken up over 70 % of urban gas pollution. Then, Beijing as the

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