THE EFFECTS OF THE COMBINED TRANSPORTATION GHG REDUCTION STRATEGIES

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Overview

As Rio+20 mentioned the application of Avoid- Shift-Improve (ASI) approach fits in well with the theme of green economy, the policies to improve technological change, efficiency enhancements, demand reduction and changes in consumer behavior are discussed widespread. Most decision makers expect these reduction strategies will abate GHG emission of transportation sector effectively, but there is no quantification evidence to support such anticipation, especially under the alternative combinations of various strategies or scenarios.

A few of transport strategies perform with multi-function. Sometimes the non-environmental benefits of green transport policies will be superior to abatement effects, such as compensation on low income groups or rural public transportation, which may induce the additional emissions. How to design the policy packages to realize the national reduction target and transport sector burden in 2025 is the most imperative mission.

In Taiwan, transport sector is the second emission source only to industry, whose emission grew 70% from 1990 to 2000, and declined to 5.28% from 2000 to 2012. Based on the BAU scenario, emission of transport sector will be 39.46 million tons in 2025 and need to reduce to 33.49 million tons to reach the reduction target. Transport sector moves with economic, society and environment so compact, that the appropriate GHG abatement strategies need a comprehensive tool to assess the reduction effects and abatement cost.

Methods

A dynamic CGE model developed for Taiwan transportation sector is used to analyze these policies effects. This model includes 8 public passenger travel modes, such as railway, metro, expressway bus, intercity bus, city bus, taxi, waterway, and airway passengers, and 5 freight travel modes, like railway, private road freight, business road freight, waterway, and airway freight. The relationships between these public transportation services are established in a multi-stages nested structure. The private passenger transportation service comprises alternative choices which are built in nested structure either. The integrated service is composed of automobile and motorcycle services, and the automobile comprises internal-combustion engine vehicles and electric vehicles. Each type of service is supplied with energy, vehicle, maintenance and all the other cost to travel by own-vehicle, which implies the household production functions are employed to describe the private transportation services.

Results

This paper compares the effects of alternative combinations of 3 transportation GHG reduction strategies under 2 crude oil import price scenarios. The transportation strategies are compensations on prices of public transport services, reform of automobile fuel use fee, and subsidies for electric cars. According to the simulation, we got some results:

(1) If the crude oil import price increases 50% relative to the baseline, the domestic gasoline retail price will extent 41% and diesel 29%, which induces 13% CO2 reduction of transportation sector in 2025.

(2) If the tax rates keep the same after reform which are 0.08 US dollar per liter gasoline and 0.05 US dollar per liter diesel, the domestic prices of gasoline and diesel will raise 7% and 4% above the baseline, and the CO2 will reduce 4.85% in 2025.
(3) If the compensation rates are 0.03 US dollar per p-km for each mode of public transport services, the total p-km will be 22% above the baseline, energy consumption will expend 1.56%, CO2 increase 3.28%, and GDP declines 0.28%.

Conclusions

According to the simulation results, we got some conclusion:

(1) The reduction effect of the fluctuation of import crude oil price is much more effectiveness, even though such an influence is uncertain and short-term.
(2) The tax reform such as the taxed object of automobile fuel use fee transformed from vehicles to fuels with the same tax rate will induce positive benefit to GDP and household income.
(3) The compensations on prices of public transport services will attract more passenger services demand and diminish GDP.
(4) Under the same total passenger transport volume, the tax reform of automobile fuel use fee will bring the more significant outcomes on modes transfer than public transport services compensations.
(5) The direct strategy of electric car subsidy will lead more electric car market share than the indirect strategy of fuel cost extension.

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