The Effect of Automobile Tax Change on Fuel Consumption

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1. Introduction

Under the Kyoto Protocol, many developed countries have struggled to reduce greenhouse gas emissions. Transport sector is one of the main carbon dioxide emitting sectors in Japan, and various strategies are introduced to reduce carbon dioxide emission in this sector. One of the main strategies is "automobile tax reform". Many countries have been used "carbon tax", but Japanese government introduced new tax / subsidy systems to the vehicle possession. Japanese strategy is not only penalizing to own high-emission vehicles with higher tax, but also promoting to own law emission vehicles with lower tax and additional subsidy. The policy intends to shift consumer's preference to eco-friendly vehicles. And also, it is expected that this shift will stimulate vehicle manufacturers to supply eco-friendly vehicles in the market.

In this paper, we examine the effect of this Japanese tax regime for shifting consumer preference to low emission vehicles. Especially, we try to discriminate the effect of the newly introduced tax system and of other factors, for instance fuel prices, and assess the recent Japanese green tax / subsidy system.

2. The status quo of CO2 emission in Japan

For the first commitment period of Kyoto Protocol, Japan faced the target of 6% reduction from the 1990's emission level. Now we are calculating the accurate figure, but we expect we can attain the target, in spite of the effects of the big earthquake.

"Transport Sector" is the second largest emission sector in Japan (Figure1), and Japanese government adopts many emission reduction policies to this sector. But main policies are concentrating on the reduction from automobiles, because emission from automobiles occupies almost 90% in transport sector.

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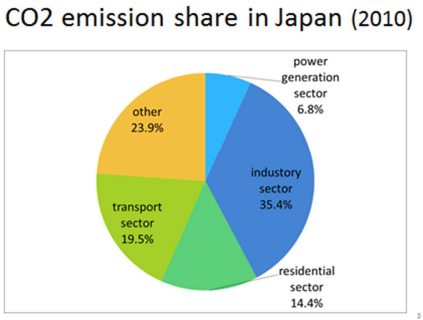
Figure 1



Source : The Energy data and modelling center(2012)

The emission target for transport sector was set to 15.9 % increase from 1990 emission level, and we can attain this target. The reason why we can attain the target in this sector is “green tax policy”.

3. The emission reduction policies for automobile in Japan

When we think about the policy for automobiles, we can find out 3 ways to reduce the emission that (1) To reduce the transportation demand by automobiles, (2) To increase the load factor of automobiles, (3) To improve the automobile’s efficiency technically. In Japan, mainly, government adopted (3) by greening taxes on vehicles.

First we should mention about the automobile taxes[2] in Japan.

- Acquisition tax : 5% for the vehicle price
- Ownership tax : annual tax (local tax)
  depends on the engine size
- Weight tax : every inspection (national tax)
  depends on the vehicle weight
- Fuel tax (for oil) : 53.8 yen / l (≒ 0.45 € [3])

To increase the “eco-car”, Japanese government have used the several kinds of economic instruments. From 2001, “Greening the vehicle taxes policy” was introduced for new automobiles, and it reduced acquisition tax and ownership tax for environmental friendly automobiles. From 2009.4, “eco-car tax reduction” was started, which also included used cars. And additionally, from 2009.4～2010.9.30 and 2011.12～2013.1, “subsidy for buying eco-car policy” was introduced temporally. But this is recognised as a kind of economic stimulus strategy.

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[2] The taxes shown here are charged on ordinal gasoline car drivers directly.
[3] 1€ ≒ 120yen

We have already mentioned about the fuel tax, but since 2012.10, new carbon tax (correctly, the name is "Special tax to deal with the global warming problem ") has been introduced to the energy sector. But this tax is charged on the fuel maker and, moreover, the tax rate is very low (760 yen /l for crude oil), the effects on drivers are limited. So "Greening the vehicle tax policy" is the main policy in this area.

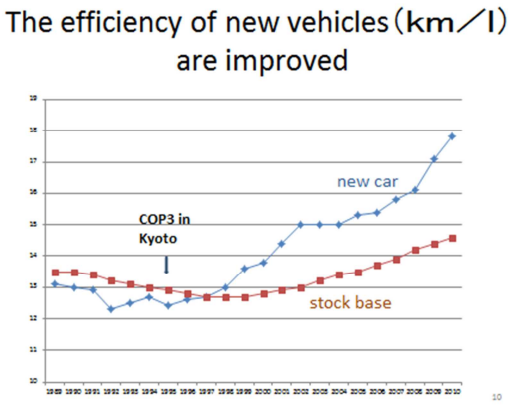
3. The status quo of the automobile use

To increase the share of "eco-car", Japanese Government announced tax discount for the environmental friendly vehicles and, on the other hand, tax increase for more than 13years old vehicles that are expected to heavy damage to the environment. And the revenue from this new tax system was set to neutral with former system.

We have expected several effects. First, the owner of an old vehicle decides to abandon their vehicle earlier. And when consumers buy their automobile, the lower cost vehicle will be favorable, so the green vehicles will be chosen. The vehicle makers try to make environmental friendly vehicles as they can serve low tax vehicles to the market. So in the new automobile, eco-cars increase their share, and consequently, average of vehicle's efficiency will be improved.

These days, almost all the new vehicles in the market are "eco-car" and the average of vehicle km /l is getting lower. So we can find out the vehicle efficiency is getting better.

Figure 2



4. The price elasticity of gasoline demand

In this chapter, the price elasticity of gasoline demand will be examined in Japan. First, we will make gasoline demand function from time-series data.

According to Dahl and Sterner (1991) and Sterner et al.(1992) , we will estimate the lagged endogenous variable model,

$$LnG_t = \theta c + \theta \alpha \ln P + \theta \beta \ln Y + (1-\theta) \ln G_{t-1} + \mu_t$$

P is price and Y is the GDP and Gt is the gasoline demand in the t period.

The datum is from 1989 to 2009, and Eco-car dummy is applied from 2001～2009, Leuman shock dummy is 2008 ～2009.

Variable	Estimated Coefficient	P-value
c	3.71405	[.000]
LOG(P)	-.126573	[.002]
LOG(Y)	.257935	[.034]
LOG(Gt-1)	.635300	[.000]
Eco-car dummy	.011683	[.087]
Leuman shock dummy	-.013110	[.085]

R-squared = .995816 Adjusted R-squared = .994322

Durbin-Watson = 2.29462

We can find out some kind of "eco-car effect". So next, we will evaluate the tax effect by using region based car varieties panel data.

5. Results/Findings

According to the vehicle registration statistics in Japan, newly registered low greenhouse gas emission vehicles are dramatically increased in recent years. And we can find out the vehicles using new technology, like hybrid vehicles and electric vehicles. It seems that Japanese green tax reform has positive effect for consumer's preference shifting. However, in recent years, world fuel prices have been dramatically increased, some part may be the result of fuel price increase.

It has been pointed out that incentive scheme is useful for GHG-gas reduction. In the presentation in summer, we will show that tax reform is effective to shift consumer's preference to eco-friendly vehicles and this shift will stimulate vehicle manufacturers to supply eco-friendly vehicles in the market. Consequently tax reform will make CO2 emission reduction from automobile.

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