

ANALYSIS ON THE ENVIRONMENTAL (CARBON) TAX AIMING TO ACHIEVE GHG'S REDUCTION TARGET OF 25% IN JAPAN

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Overview

Japan's 25% reduction target of GHGs (green house gases) from the 1990 emission level in 2020 was internationally committed by the former Prime Minister Hatoyama at the New York UN Conference in 2009. Now the first period of Kyoto Protocol has just finished, and Japan needs to cope with the 25% reduction of GHGs toward 2020 as a next target. For this purpose, new additional measures would be required to be adopted, and the environmental (carbon) tax would be an important candidate option which is eagerly and widely discussed. Therefore, we would like to analyze the expected effects brought by the different types of environmental (carbon) tax in this study.

Methods

We defined three different types of environmental (carbon) tax, that is, Type 1, Type 2 and Type 3. The tax revenue of Type 1 environmental (carbon) tax is all used to reduce social and welfare costs, and therefore the GHGs' reductions are made only by the price effect caused by the taxation. The tax revenue of Type 2 environmental (carbon) tax is all used to cover total necessary costs of domestic reduction measures such as energy savings, introduction of renewable energies, switching to natural gas and so on. Thus, in this case, the GHGs' reductions are made by the price effect caused by taxation and by the revenue effect caused by covering the cost of domestic measures. The tax revenue of Type 3 environmental (carbon) tax is all used to cover total costs for obtaining necessary CO₂ reduction credits. In this case, the GHGs' reductions are mainly made by the acquisition of CO₂ reduction credits. The small price effect caused by the taxation is worked slightly.

We compared the three different types of environmental (carbon) tax from the viewpoints such as the size of tax rate, the size of tax revenue and the size of GHGs' reduction. We also discussed merits and demerits of three different types of environmental (carbon) tax.

Results

The analyzed results of three different types of environmental (carbon) tax are shown in Table 1 and Fig. 1. In order to estimate the size of CO₂ reduction, we adopted the value of 0.45 as the average price elasticity to energy consumption which was obtained by Amano [2011]. We also used the reduction cost curve of domestic measures estimated by the Ministry of Environment [2006]. We further obtained CO₂ reduction credit prices formed in the EU emission trading market (World Bank [2012])

Table 1 Comparison of Three Different Types of Environmental (Carbon) Tax

		Carbon Tax (Type 3)		Carbon Tax (Type 2)	Carbon Tax (Type 1)
		Credit Price (US\$ / t-CO ₂)			
		17 US\$: 1,445 Yen	30 US\$: 2,550 Yen		
Carbon Tax Rate	(Yen / t-CO ₂)	554	958	11,392	38,259.6
Reduction by price	(1,000 t-CO ₂)	10,374	17,664	170,559	361,250
Reduction by revenue	(1,000 t-CO ₂)	350,876	343,586	190,691	0
Total reduction	(1,000 t-CO ₂)	361,250	361,250	361,250	361,250
Carbon Tax Revenue	(Billions Yen)	506.8	876.1	8,080.5	27,138.0

Conclusions

First, as for Type 1 of environmental (carbon) tax, the necessary CO₂ reduction of 361.25 million t-CO₂ is achieved only by the price effects of taxation and the carbon tax rate is reached to the quite high level of 38,259.6 Yen / t-CO₂. In this case, the revenue of carbon tax is also reached to the quite huge size of 27.138 trillion Yen.

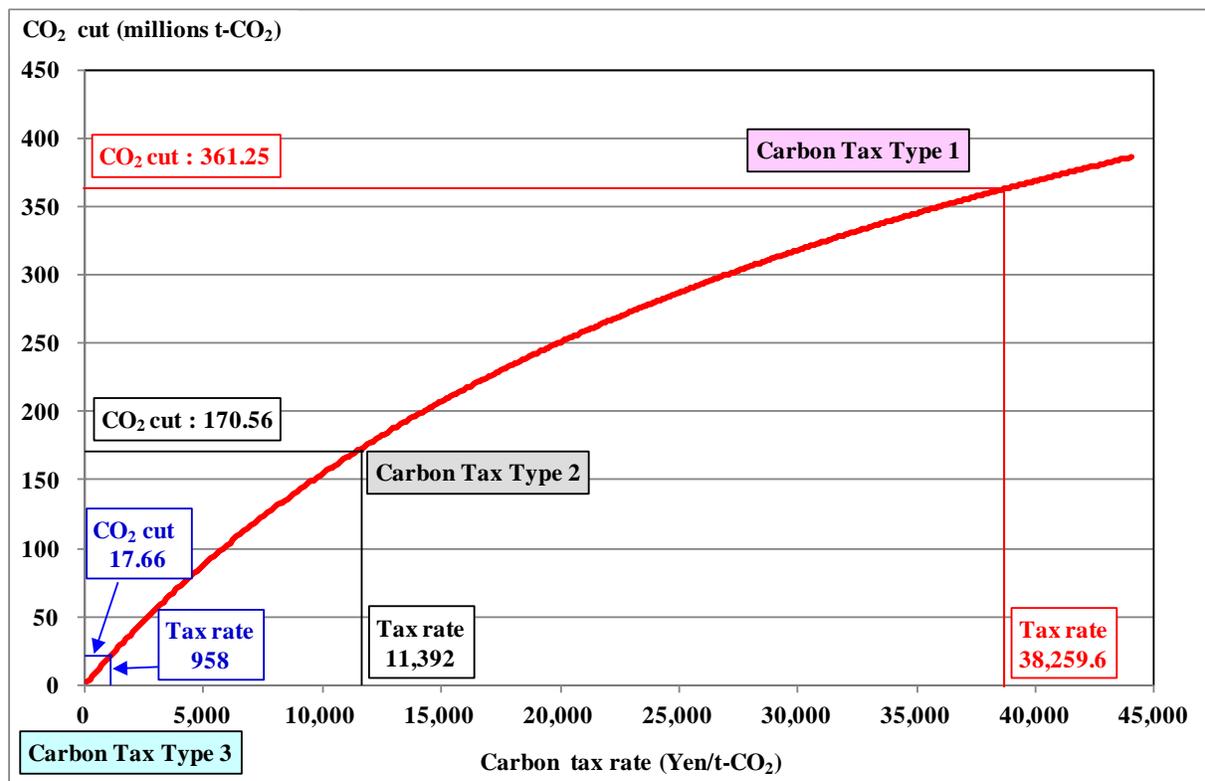


Fig. 1 Tax Rate and CO₂ Reduction (Price Effect) by Type of Carbon Tax

Second, as for Type 2 of environmental (carbon) tax, the necessary CO₂ reduction is almost evenly shared to that caused by the price effect of taxation (170.559 million t-CO₂) and to that caused by the revenue effect of covering the necessary cost of domestic reduction measures (190.691 million t-CO₂). In this case, the carbon tax rate is 11,392 Yen / t-CO₂ and still high. The size of tax revenue is reached to 8.08 trillion Yen and also still large.

Third, as for Type 3 of environmental (carbon) tax, the necessary CO₂ reduction is mainly made by the revenue effect of covering the necessary cost of CO₂ reduction credit acquisition (343.586~350.876 million t-CO₂) under the quite low tax rate of 554~958 Yen / t-CO₂. The small CO₂ reduction of 10.374~17.664 million t-CO₂ is also made by the price effect of taxation. In this case, the size of tax revenue also remained to the low level of 506.8~876.1 billion Yen.

Thus, we conclude that Type 3 of environmental (carbon) tax would be reasonable and desirable as an additional measure for the 25% GHGs' reduction required in the next step toward 2020, because both sizes of carbon tax rate and tax revenue are considered to be quite suitable.

References

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