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The Impact Assessment of Various Carbon Tax Rate on the Economy and CO₂ Emission of Taiwan

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Overview

For reducing carbon emission and green tax reform, the government of Taiwan is planning to levy carbon tax. Although the tax rate has not been finalized yet, the tax revenue will be used for : 1) eliminating all excise tax and entertainment tax, 2) increasing allowance in personal income tax, 3) providing energy subsidies to low income family and 4. funding R&D on green house gas reduction. In fact, some of the European countries, such as Sweden, Norway, Denmark, Netherlands and Finland have already implemented carbon tax with various tax rate: Norway's carbon tax rate varies from \$15.93 to \$61.76 per metric ton CO₂. Denmark's tax rate is equivalent to \$16.41 per metric ton CO₂. Netherlands' carbon tax is \$20 per metric ton CO₂. And Sweden's standard rate \$104.83 per metric ton CO₂. The objective of this paper is to compare the affect of different carbon tax rate adopted by the European countries with different tax revenue deposition scheme aforementioned on the economy and CO₂ reduction in Taiwan. The finding will be provided to the government of Taiwan for determining the carbon tax rate. It will also be useful for policy reference of other developing countries.

Methods

The simulation model employed is dynamic general equilibrium model of Taiwan (DGEMT) or Liang-Jorgenson(2003).The DGEMT is consists of the following four sub-models: 1) the producer's model; 2) the consumer's model; 3) the DGBAS's macroeconomic model; and 4) the MARKAL engineering energy model of the Industrial Technology Research Institute (ITRI). The policy scenario takes carbon taxes of northern Europe nations as reference, and estimates the effects of carbon taxes on the economy of Taiwan.

Results

We apply the DGEMT to simulate Norway's carbon tax rate as reference to measure the effect of economic growth, CPI and CO₂ emission in Taiwan. By adopting the one-step carbon tax approach at \$15.93 per metric ton CO₂ in 2014, the economic growth goes down by -0.9 percent, the CPI will rise

4.15 percent, and the reduction of CO₂ emission is by -9.05 percent; while by implementing progressive carbon tax rate to \$15.93 per metric ton CO₂, the economic growth is down by -0.8 percent, the CPI will increase 2.18 percent, and the reduction of CO₂ emission is about -23.75 percent by 2035. If imposing the highest carbon taxes by one-step approach at \$104.83 per metric ton CO₂ (Denmark reference) in 2014, the economic growth goes down to -2.08 percent, the CPI will raise 7.73 percent, and the reduction of CO₂ emission is by -43.21 percent; while by implementing progressive carbon tax rate to \$104.83 per metric ton CO₂, the economic growth is down by -1.94 percent, the CPI will increase 4.32 percent, and the CO₂ emission will decline -43.05 percent by 2035.

Conclusions

From the above finding, we conclude that carbon taxes are efficient means of reducing carbon emissions and the Norway's carbon tax is suitable for Taiwan. However, the higher carbon taxes have significant negative effects on economic growth and CPI. Consequently, to moderate the adverse impact, the government should consider the progressive approach to increase the carbon taxes every year in order to enhance the effectiveness in CO₂ emission reduction and minimize its negative impacts on the economy. If we implement the carbon tax with tax revenue deposition will lessen the negative effects, but it still needs a further discussion.

Reference

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