The Regressivity of Climate Policy in Taiwan: A General Equilibrium Analysis

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Overview

The Legislative Yuan of Taiwan passed the Greenhouse Gas Emission Reduction and Management Act in June, 2015. This act offers a legal basis for a series of response measures to climate change in Taiwan, demonstrating Taiwan's serious commitment to protecting the global environment. According to the Act, a long-term CO_2 emission reduction target in 2050, as well as periodic five-year reduction targets shall be met with the introduction of various policy measures and economic incentives. While the regressive nature of energy and environmental taxes is commonly seen in theory and practice, policy measures that could effectively reduce the emissions might, at the same time, worsen income distributions (Grainger and Kolstad, 2009). It is therefore very important to design accompanying policies that distribute part of the tax revenue to the hardest hit groups and reduce the regressivity of the policy. This paper examines the regressivity of several potential policy measures to meeting the reduction targets and explore what policy combinations could more effectively reduce the regressivity.

Methods

The method used is a SAM-based dynamic computable general equilibrium (CGE) model for Taiwan specializing on income distribution mechanisms. One of the key features of the model is that it takes into account the characteristics of green taxation and specifies corresponding taxing mechanisms for different taxation systems. Detailed household income and expenditure data fitting to the model structure are compiled from the raw household income and expenditure survey data collected by the DGBAS of Executive Yuan, Taiwan. The model categorizes 30 sectors with an emphasis on energy-related sectors, such as primary energy sectors, refined petroleum products, electricity generation technologies, etc. The model also distinguishes 10 income groups, with each group constituting 6 occupation categories. The benchmark year of the model is 2011. In generating the baseline results, we perform a historical simulation for years 2012-2015, and then run the model through 2050 recursively.

Results

We simulate a carbon tax be levied, with a corresponding increase in government transfers, a reduction of commodity tax or a reduction of household income tax. Separate scenarios of taxing carbon emissions or energy usage in combination of increasing government expenditure are also performed.

Our baseline results show that CO_2 emission will reach a level of 358 and 422 million tons in 2030 and 2050, respectively. Income distribution, as measured by Gini coefficient, will worsen slightly from 0.34 to 0.36 during the 2011-2050 periods. Policy simulations are formulated to meet the reduction targets set by the Greenhouse Gas Emission Reduction and Management Act for 2030 and 2050, and the policy tool used is a carbon tax. Our results indicate that abating CO_2 emission by taxing carbon when accompanied by an increase in government transfer to households or a reduction of commodity tax will significantly ease the regressivity of the policy. Specifically, if the majority of tax revenue are recycled as transfer payment to lower-income groups, the policy could even become progressive.

Conclusions

Meeting the reduction tergets set by the Greenhouse Gas Emission Reduction and Management Act is not an easy task, as it might encounter two significant obstackles: the acceptance of the measures to reducing the emissions by the general public and the potential regressivity that the measures might generate. We found that the design of policy measures to reduce emissions should always be accompanied by carefully designed complementary policies, such that the regressivity of the policy could be reduced. Specifically, transferring the tax revenue to households or reducing the commodity tax rates are considered better policies to offset the regressiveity of the climate policy in Taiwan.

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