

ベトナムにおけるカーボンプライシングの環境および経済への影響
-数値解析的一般均衡モデルにおけるシミュレーション分析-

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Carbon Pricing in Vietnam: Simulations of Environmental and Economic
Impacts with a Computable General Equilibrium Model

Major: Global Governance

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1. Research goal

The main objective of this dissertation is to analyze the impacts of carbon pricing including carbon tax and ETS on the macro-economic and sectoral levels in Vietnam. This dissertation examines all changes in the economy, welfare, and environment when carbon pricing is introduced. In addition, this dissertation also analyzes the impact of carbon pricing revenue recycling options to determine the impacts of recycling policies on carbon pricing. The specific research objectives include (1) To examine the pure impacts of a carbon tax on the economy and environment at macro and sectoral levels in Vietnam; (2) To examine the pure impacts of ETS on the economy and environment at macro and sectoral levels in Vietnam; (3) To examine the impacts of carbon pricing under various revenue recycling policies.

2. Summary of the chapters

Chapter 1 discusses the background of climate change and emphasizes that carbon pricing would assist in reducing GHG emissions in Vietnam. This Chapter shows the objective of the research and provides an overview of the methodology used in this dissertation. The structure of the dissertation and the expected contribution of the research are

also provided in this Chapter.

Chapter 2 presents an overview of climate change and the increase in GHG emissions in the world and Vietnam. In this Chapter, mitigation policies are also introduced and analyzed. In Vietnam, although the Vietnamese government has introduced a lot of regulations on emissions reduction as well as changed its economic development strategy, these measures have not led to significant emissions reduction. To achieve Vietnam's NDC targets, carbon pricing was introduced in the Law with the expectation that this measure would be an effective tool to support meeting its targets.

Chapter 3 designs carbon tax scenarios for Vietnam based on the current carbon prices in literature and practice in different countries from the lowest to higher levels for matching with some countries with the same economic situation or the same region. The pure impacts of carbon tax are simulated by using a static CGE framework. A new flexible carbon tax mechanism is designed in this study to improve adequate coverage of emissions resources. The results show that the carbon tax would lead to a decrease in emissions, but it causes negative effects on the economy and welfare. With US\$1/tCO₂eq, US\$5/tCO₂eq, and US\$10/tCO₂eq, the country would be able to reduce its emission levels by 0.2% - 4.5% (0.47 - 9.90 MtCO₂eq) at the cost of GDP reduction of 0.11% - 2.32%. Moreover, fewer sectors covered by carbon tax would cause lighter economic and welfare loss but lower emissions reduction. At the sectoral level, the carbon tax would lead to a restructuring of the economy, with the production of mining and high carbon-intensive industries shrinking sharply while the outputs of other sectors slightly declining. Interestingly, the electricity generation sector, the exceptional carbon-intensive sector in Vietnam, would be the most affected and also the main contributor to reducing emissions in Vietnam, accounting for 38.4% of total carbon emissions under the carbon tax policy.

Chapter 4 bases on Vietnam's GHG emissions reduction targets in NDC and the emissions reduction level identified in Chapter 3 to design ETS scenarios and analyze the

pure impacts of ETS on the environment and economy in Vietnam. By using a national static CGE model, the simulation results show that to achieve Vietnam's GHG emissions reduction targets of 9% and 15.8% in NDC, carbon prices are estimated at US\$23.278/tCO₂eq and US\$56.608/tCO₂eq respectively. With a target of 15.8% emissions reduction, the ETS considerably impacts the economy with a decrease in GDP by 3.694%. The country experiences much smaller impacts with a lower target of 9%. Compared with a carbon tax at the same emissions reduction of 4.5%, the impacts of ETS on GDP and welfare are less than that of the carbon tax. In all ETS scenarios, the electricity generation sector is the main factor in reducing carbon emissions but its output is highly adversely affected. Compared with carbon tax, the sectoral effects of ETS are much more concentrated.

Chapter 5 analyzes carbon pricing combined with the redistribution of revenue from carbon pricing. The results indicate that the revenue recycling policies would lighten the negative impacts of carbon pricing on GDP and welfare. While the revenue transferring to government activities leads to an increase in GDP, cutting income tax policy results in improving both GDP and welfare. At the sectoral level, the revenue redistribution for government activities could improve the outputs for the construction and some heavy industries while the recycling policy for households creates improvements for the light industries and service sectors. In addition, carbon tax revenue recycling policies could lead to higher GDP growth and welfare than the ETS revenue recycling policies but carbon tax revenue recycling policies could reduce the impacts of the carbon tax on mitigating emissions, even distorting the original goal of the carbon tax policy with a sign of rebound emissions.

Chapter 6 reviews the research and presents the main findings, conclusions, and policy implications. It concludes that carbon pricing is an effective way to curb GHG emissions in Vietnam. Both carbon tax and ETS would lead to emissions reduction, but the reduction levels as well as their impacts on the economy and welfare are different depending on carbon pricing mechanisms, carbon price, and sector coverages as well as revenue

redistribution policy. Therefore, while carbon pricing is a necessary tool in emission mitigation strategy in Vietnam, designing carbon pricing and revenue redistribution policies should be considered carefully. This study also suggests that a lower target at the first stage of ETS implementation is appropriate in Vietnam, which assists firms in transferring their business to adapt to the new policy. The electricity generation sector is the main contributor to reducing emissions in all carbon pricing scenarios, but its output also declines drastically. Therefore, this study suggests that Vietnam should pay more attention to the electricity sector in its environmental policies.