

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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Doctoral Dissertation Examination Report

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

(Japanese) 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

III Structure

This dissertation follows the structure below:

Chapter 1: Introduction

Chapter 2: Climate change and emissions mitigation efforts

Chapter 3: The potential impacts of a carbon tax in Vietnam

Chapter 4: The potential impacts of a carbon emission trading scheme in Vietnam

Chapter 5: Carbon pricing with revenue redistribution policies

Chapter 6: Discussions and conclusions

IV Summary

Chapter 1 discusses the background of climate change and emphasizes that carbon pricing would assist in reducing GHG (Greenhouse Gas) 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.

V Originality

In the current literature, the impact of carbon tax policies and also that of ETS are separately examined, and thus there remains controversy about which policy is better in terms of the impacts on GDP and welfare. Furthermore, the impact of newly generated revenue by either policy has not been studied in the literature. This dissertation tries to examine these open questions in the Vietnamese context within the CGE framework with the latest available data. Thus, while this dissertation has obtained several results with its theoretical framework, all results and suggestions are very practical and suggestive to ongoing environmental arguments in Vietnam. By constructing its own CGE framework, its originality can be found theoretically and practically.

VI Evaluation

The examiners find its originality as mentioned above. The examiners also evaluate its contributions to the current literature academically as well as practically.

Academically, the dissertation shows that with the same emission reduction level,

the carbon tax has a more negative impact on GDP and welfare than ETS. However, the ETS impact on industries is more concentrated than the carbon tax impact. Furthermore, it shows that the impacts of carbon pricing will differ when combined with recycling policies. Reuse carbon pricing revenue could lighten the negative impacts of carbon pricing on economic growth and welfare. However, reuse revenue could lead to emissions rebound effect (under carbon tax) or cause more negative impacts on some specific sectors such as electricity generation (under ETS). Finally, regarding research methodology/scenario designs, this study constructs more flexible and realistic models for measuring the impacts of different carbon pricing scenarios.

Practically, its originality is found as follows. Under the carbon tax scheme, the carbon prices of \$1-10/tCO₂eq are not enough to achieve the emissions reduction goals in Vietnam's NDC, even if the carbon tax covers all sectors. Meanwhile, the carbon tax has strong negative impacts on GDP and welfare. Furthermore, to achieve the emissions reduction targets in Vietnam's NDC through the ETS mechanism, the carbon prices are also quite high, much higher than countries with the same conditions in the early stages of implementing carbon pricing. Along with that, the loss of GDP and welfare is also quite high. The ETS has a strong sectoral concentration impact, with a significant output drop in the electricity sector, which can cause risks in ensuring electricity security. Finally, reuse revenue could reduce the negative impacts of carbon pricing on GDP growth and welfare but those policies could reduce the impacts on mitigating carbon emissions or cause more negative impacts on the electricity sector.

Therefore, the examiners agree that this dissertation satisfies all the academic requirements of doctoral thesis.

VII Recommendation

The dissertation has been submitted on having received the necessary research guidance from the Graduate School of Global Governance. It is judged to be worthy of having the degree of Doctor of Philosophy in Global Governance conferred on the candidate as a result of the reviews and the final examination by all members of the examination committee in accordance with the procedures of the Degree Regulations of Meiji University.

Chair Examiner (Signature) _____