

The Impact of a Carbon Tax on FDI from Japan: A DiD Analysis of Major Countries

ZHANG KEQI

Aoyama Gakuin University

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Background and Motivation

- In recent years, addressing climate change has become a critical international priority, prompting many countries to implement environmental policies aimed at reducing greenhouse gas emissions. Among these, carbon taxes have gained significant attention. By imposing costs on corporate CO₂ emissions, these policies not only encourage emission reductions but also potentially influence production costs and corporate profitability. Such changes may, in turn, affect corporate decisions on investment locations and activities, raising the need for further investigation into how these impacts manifest in foreign direct investment (FDI).
- This study focuses on the FDI from Japan to major countries and aims to analyze the effects of carbon tax implementation on FDI patterns.

Objectives

- This study aims to empirically elucidate the impact of carbon tax implementation in major countries on foreign direct investment (FDI) from Japan to these destinations.
- Specifically, the study employs a dynamic Difference-in-Differences (DiD) analysis to evaluate the effects of carbon tax introduction on FDI during the period from 2010 to 2018.
 - Countries that introduced carbon taxes after 2014, including France, Mexico, and Spain, are categorized as the treatment group.
 - Countries that have not implemented carbon taxes, such as Singapore, Canada, the Netherlands, Germany, the United States, Italy, and Belgium, are classified as the control group.
- By conducting this research, the study seeks to enhance the understanding of how carbon tax policies influence Japanese firms' overseas investment behavior. Furthermore, it aims to contribute to the formulation of policy frameworks that balance sustainable economic growth with environmental protection.

Literature Review (1)

Metcalf, G. E., & Stock, J. H. (2023). The macroeconomic impact of Europe's carbon taxes. *American Economic Journal: Macroeconomics*, 15(3), 265-286.

- Metcalf and Stock (2020) conducted a regression analysis to examine the impact of carbon taxes implemented in Europe on GDP and employment.
- Using 30 years of data, their study clarified that carbon taxes have not caused significant negative effects on economic growth or employment.
- The study revealed that carbon taxes impose short-term burdens on specific industries, particularly energy-intensive sectors. However, other sectors, especially renewable energy-related industries, benefit from these policies, resulting in a balance between employment and economic growth in the long run.
- Furthermore, their analysis highlighted the potential for carbon taxes to increase energy prices, which could, in the long term, promote productivity improvements and technological innovation.

Literature Review (2)

Borghesi, S., Franco, C., & Marin, G. (2020). Outward foreign direct investment patterns of Italian firms in the European Union's emission trading scheme. *The Scandinavian journal of economics*, 122(1), 219-256.

- Borghesi et al. (2018) analyzed the impact of the EU Emissions Trading System (EU ETS) on the outward foreign direct investment (FDI) behavior of Italian manufacturing firms. This study utilized data from 2005 to 2010 and employed a Difference-in-Differences (DiD) analysis to examine how the introduction of the EU ETS influenced corporate investment activities.
- The findings indicated that the EU ETS had minimal impact on outward FDI in the form of new overseas subsidiary establishments. However, for existing overseas subsidiaries (intra-firm activities), the study observed significant impacts. In trade-intensive industries, the EU ETS particularly prompted firms to strengthen offshore production as a means to mitigate carbon-related costs. This research provided critical insights into understanding how environmental policies influence corporate investment decisions.

Literature Review (3)

Duarte, L. D. R. V., Kedong, Y., & Xuemei, L. (2017). The relationship between FDI, economic growth and financial development in Cabo Verde. *International Journal of Economics and Finance*, 9(5), 132-142.

- Duarte et al. (2017) analyzed the impact of FDI on economic growth and financial development in Cabo Verde, using data from 1987 to 2014. The study employed ARDL (Autoregressive Distributed Lag) co-integration analysis and ECM-Granger causality tests.
- The research aimed to investigate how FDI affects economic growth in Cabo Verde and its relationship with financial development. The results revealed a bidirectional causal relationship between FDI and economic growth, indicating that FDI promotes economic growth, while economic growth also attracts FDI.
- Additionally, the study highlighted that domestic economic growth and increased private sector domestic credit are critical determinants of FDI inflows.
- These findings highlighted the need to strengthen domestic financial development and infrastructure, particularly in smaller economies, where FDI significantly supports economic growth.

Data

The data used in this study are as follows:

- Ministry of Economy, Trade and Industry (METI) “Basic Survey on Overseas Business Activities”
 - Number of Japanese firms entering industries and countries, 2010–2018
- World Bank

GDP, labor costs, market accessibility, etc.

Method - Dynamic DiD

- Outcome Variable : Number of Japanese firms entering major countries
- Treatment Variable : Introduction of carbon tax
- Covariates : GDP, labor costs, market accessibility, etc.

Methodology (1)

$$FDI_{it} = \gamma_i + \lambda_t + \sum_{\tau=-q}^{-1} \gamma_{\tau} D_{t\tau} + \sum_{\tau=0}^m \delta_{\tau} D_{t\tau} + \varepsilon_{it}$$

- FDI_{it} : The number (or ratio) of Japanese firms entering country i at time t
- γ_i : Country fixed effects, λ_t : Time fixed effects
- $\sum_{\tau=-q}^{-1} \gamma_{\tau} D_{t\tau}$: Terms related to the pre-carbon tax introduction dummy variable $D_{t\tau}$
- $\sum_{\tau=0}^m \delta_{\tau} D_{t\tau}$: Terms related to the post-carbon tax introduction dummy variable $D_{t\tau}$
- ε_{it} : Error term

Methodology (2)

$$FDI_{it} = \gamma_i + \lambda_t + \sum_{\tau=-q}^{-1} \gamma_{\tau} D_{t\tau} + \sum_{\tau=0}^m \delta_{\tau} D_{t\tau} + X_{ipre} \beta + \varepsilon_{it}$$

- FDI_{it} : The number (or ratio) of Japanese firms entering country i at time t

- γ_i : Country fixed effects、 λ_t : Time fixed effects
- $\sum_{\tau=-q}^{-1} \gamma_{\tau} D_{t\tau}$: Terms related to the pre-carbon tax introduction dummy variable $D_{t\tau}$
- $\sum_{\tau=0}^m \delta_{\tau} D_{t\tau}$: Terms related to the post-carbon tax introduction dummy variable $D_{t\tau}$
- $X_{ipre} \beta$: Covariates such as GDP, labor costs, and market accessibility, which may influence FDI
- ε_{it} : Error term

Proposed Structure of the Master's Thesis

- Introduction (Research Background, Research Objectives, and Structure of the Thesis)
- Literature Review
- Methodology
 - Data and Collection Methods
 - Analytical Methods
 - Hypothesis Development
- Discussion
 - Results
 - Challenges
- Conclusion
- References

Expected Results

- This study aims to examine the impact of carbon tax implementation on Japan's foreign direct investment (FDI) in major countries.
- Short-Term Effects: Decrease in FDI
 - It is anticipated that FDI will decrease in the short term if host countries implement carbon taxes. This is because carbon taxes increase production costs, causing firms to limit their investments in host countries. Particularly in energy-intensive industries, the burden of rising carbon costs may lead firms to increase investments in other countries.
- Long-Term Effects: Promotion of Investments in Clean Technology
 - In the long term, if host countries adopt carbon taxes, FDI in areas related to environmentally friendly technologies and clean energy is expected to increase. Firms are likely to shift to sustainable business models, promoting the adoption of low-carbon technologies and clean energy. Consequently, investments may concentrate in countries equipped to adapt to these technologies.

Expected Results(Continued)

- Regional Differences in Impact
 - The impact of carbon tax implementation on FDI may vary by country or region. In countries with stricter regulations or inadequate infrastructure to absorb the costs of carbon taxes, a significant decrease in FDI is likely. Conversely, in countries with well-established environmental infrastructure, stricter environmental regulations could encourage greater FDI inflows.

References

- Borghesi, S., Franco, C., & Marin, G. (2020). Outward foreign direct investment patterns of Italian firms in the European Union's emission trading scheme. *The Scandinavian journal of economics*, 122(1), 219-256.
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