Do the manufacturing industries in Taiwan transfer their polluting production via foreign direct investment?

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Overview

- The positive coefficients of World Bank, International Monetary Fund, and World Economic Forum.
- On the contrary, polluting firms (PINDU=1) have a negative direct effect (\( \alpha_5 + \alpha_7 \)) and a positive indirect effect (\( \alpha_1 + \alpha_2 + \alpha_3 + \alpha_4 \)).
- Summary of statistics on approved outward investment by the Investment Commission of the Ministry of Economic Affairs (MOEA), Taiwan, the outward investment of Taiwanese manufacturing industries appears a significant surge in both cases and amounts since 1987.
- The main purpose of this study is to examine whether the stricter environmental stringency accounts for partial variations of the outward investments of Taiwanese manufacturing industries.

Data & Model

- The government initially enacted several environment statutes since the middle 1970s (e.g., Water Pollution Control Act and the Waste Disposal Act in 1974; Air Pollution Control Act in 1975; Noise Control Act in 1983).
- However, economic growth remained the primary national target for Taiwan in the 1980s (statutes had been revised slightly and the supervision did not sufficiently implement the environmental statutes).
- As both environmental regulations and their enforcement had been enhanced from the early-1990s.
- The potential explanation for the contradiction to Pollution Haven Hypothesis is that the pollution haven effect is stronger in the small countries.

Empirical Results

- To avoid the misspecification induced by measurement error of environmental stringency and the aggregate variables of host country, we adopt Multinomial Logit (MNL) model as a check of assumption concluded from the unbalanced panel data analyses.
- Given firm’s direct investment in China is the baseline, the log-odds ratio indicates the relative probability of firms’ investing in country

- Conclusion
- Multinomial Logit Analysis

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<thead>
<tr>
<th>Variables</th>
<th>Definitions</th>
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<tbody>
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<td>( k_i )</td>
<td>Dummy variable to indicate if country i is in the PHH group.</td>
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<tr>
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<th>Notes</th>
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- The results imply environmental protection expenditure may induce a counter effect against pollution haven effect (PHE) to manufacturing firms.
- For firms with higher levels of environmental protection expenditure (e.g. polluting firms), it is smaller than the counter effect such that the phenomenon against PHH occurs.

Summary: (1) polluting firms’ behaviors are counter-PHE in four (i.e. Hong Kong, Japan, Malaysia, and Thailand) countries. (2) Non-polluting firms are more like the pollution haven seekers than polluting firms in two (i.e. United States and Philippines) of the four countries where polluting firms’ behavior support PHE.

Conclusion

- Larger size of a firm in Taiwan significantly and positively correlates to the higher FDI, which support the conceptual framework of the proximity-concentration trade-off between multinational sales and trade.
- Higher R&D expenditure or higher FDI, which supports the view point of intangible asset theory.
- The potential explanation for the contradiction to Pollution Haven Hypothesis is that the pollution haven effect is stronger in the small countries.
- The data we apply covers the period of the early 2000s while both environmental regulations and their enforcement had been enhanced since the early-1990s. That implies the polluting firms, which could not stand for the stricter environmental regulations, may have left the market in the early stage.
- The results of this study also provide one possible version of Porter’s hypothesis that environmental regulation may have a positive effect on the international competitiveness of domestic firms.

Data Sources

- Annual surveys on outward foreign direct investment and manufacturing operations conducted by the Ministry of Economic Affairs (MOEA), in Taiwan.
- World Bank, International Monetary Fund, and World Economic Forum.
- This study applies the firm-level data in manufacturing sectors from the year 2000 to 2003 of the period, including 1751 observations.

Regression Model

- Larger size of a firm in Taiwan significantly and positively correlates to the higher FDI, which support the conceptual framework of the proximity-concentration trade-off between multinational sales and trade.
- Higher R&D expenditure or higher FDI, which supports the view point of intangible asset theory.
- The potential coefficients of \( K1 \) and \( K2 \) are consistent with the conclusions made by previous studies that the increasing outward FDI of Taiwanese manufacturing sector was induced by increasing production costs.
- Positive direct effect (alpha 3) and negative value of indirect effect (alpha 12) suggest that non-polluting firm’s FDI behavior consists with the statement of pollution haven hypothesis.
- On the contrary, polluting firms (PINDU=1) have a negative direct effect (alpha 5 + alpha 7) and a positive indirect effect (alpha 12 + alpha 13), which does not consist with the statement of pollution haven hypothesis.
- The potential explanation for the contradiction to Pollution Haven Hypothesis is that the pollution haven effect is stronger in the small countries.
- The data we apply covers the period of the early 2000s while both environmental regulations and their enforcement had been enhanced since the early-1990s. That implies the polluting firms, which could not stand for the stricter environmental regulations, may have left the market in the early stage.
- This result may fit one possible version of Porter’s hypothesis that environmental regulation may have a positive effect on the international competitiveness of domestic firms.

Summary

- The counter effect against pollution haven effect (PHE) to manufacturing firms. For firms with higher levels of environmental protection expenditure (e.g. polluting firms), it is smaller than the counter effect such that the phenomenon against PHH occurs.
- The activities of pollution abatement required to meet the standards of environmental regulations may enable manufacturing firms with more knowledge and capability to comply with stricter environmental regulations in other countries.