



Environmental Taxation: Stimulus or Hindrance to Innovation? Porter Hypothesis Test in the Major Provinces of Energy Consumption in Iran*

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Abstract

The impact of environmental taxes on innovation is a complex and debated topic. This research aims to investigate the effect of environmental taxes, as a market-based instrument for internalizing external costs, on innovation in selected provinces of Iran within the framework of the Porter Hypothesis. The main research question is whether environmental taxes stimulate innovation or have a deterrent effect on it. To this end, data from 15 selected provinces of Iran were collected for the period 1385 to 1401 (2006-2022) and analyzed using the Quantile Panel Regression model. The innovation index was considered based on research and development expenditures. The effect of green taxes was examined alongside variables such as the value added of industrial workshops, gross fixed capital formation, employment of university-educated labor, and export capacity of industries. The research findings indicate that industrial value added, gross fixed capital formation, educated human resource employment, and export capacity have a positive and significant effect on innovation. Conversely, environmental taxes had a negative and significant effect on the innovation index across all quantiles, thus the Porter Hypothesis is not confirmed in the studied provinces. These results suggest that the cost pressure from environmental taxes, financial resource constraints, and the lack of complementary supportive policies have led to a decline in innovation by reducing investment in research and development. Finally, it is recommended that a portion of the revenues generated from environmental taxes be redistributed in the form of R&D incentives, subsidies for clean technologies, and financial facilities. Furthermore, the design of these policies should be tailored to the industrial structure and innovation capacity of the regions to transform deterrent effects into positive impacts.

Keywords: Quantile Panel Regression Model, Porter Hypothesis, Green Tax, Environment, Innovation.

JEL Classification: Q55, Q58, H23, C23.

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1. Introduction

Green taxes are recognized as highly efficient and effective policies for achieving a green economy and transitioning from current conditions. This policy tool offers considerable advantages, capable of simultaneously realizing environmental, economic, and social goals. Green taxes can address market failures by pricing environmental externalities, enhance efficiency and optimize resource allocation, foster the creation of green products, incentivize the development of new innovations, and promote social welfare. Among the factors influencing economic variables, taxation, and specifically environmental taxes, plays a significant role. In this context, this study aims to establish a conceptual framework to examine the impact of environmental taxes on innovation indices in selected Iranian provinces that exhibit substantial energy consumption. Consequently, this article seeks to answer the question of whether environmental taxes stimulate innovation within the Iranian economy, with the primary objective of testing the Porter Hypothesis in the Iranian context.

2. Theoretical framework

Environmental taxes are key tools for internalizing pollution costs, but their effect on innovation is debated. Porter's Hypothesis argues that such taxes can drive innovation through:

- a. Raising costs for polluters, pushing firms toward cleaner methods.
- b. Encouraging process improvements that cut waste and raise efficiency.
- c. Giving innovators a competitive edge.
- d. Fostering clean-tech clusters and collaboration.

While Porter's Hypothesis highlights the potential benefits of environmental taxes for innovation, these taxes can also exert negative influences. An analysis of both aspects reveals:

a. **Positive Effects (Innovation Stimulus):** Environmental taxes motivate companies to invest in pollution-reducing technologies, such as those related to renewable energy, recycling, and waste management. They encourage firms to optimize production processes to minimize resource consumption and waste. These taxes can also drive the development of new eco-friendly products with higher market demand, as companies strive to reduce costs and meet regulatory requirements through efficient resource management and reduced consumption of energy and raw materials (Ouyang et al., 2022).

b. **Negative Effects (Innovation Inhibition):** Conversely, environmental taxes can increase production costs and diminish industry profitability, potentially reducing investments in research and development (R&D) and innovation. If such taxes are implemented unilaterally, companies may shift production to jurisdictions with less stringent regulations, potentially increasing global pollution. Firms in heavily polluting industries may experience diminished competitiveness due to higher costs.

Some companies might prioritize mere compliance over fundamental innovation.

The net impact of environmental taxes on innovation is contingent upon various factors, including tax intensity, the specific design of the tax (e.g., exemptions, incentives), overall economic conditions, market structure, industry characteristics, and the presence of complementary policies. Generally, environmental taxes can be effective instruments for promoting innovation in clean and sustainable technologies, provided they are carefully planned and implemented.

3. Methodology

This article investigates the effect of environmental taxes on Innovation index in selected provinces of Iran, which have a significant share in the country's energy consumption. To achieve the stated objective, all necessary statistics and data were extracted from statistical websites for the period spanning 2006 to 2022 for 15 selected provinces, including: Isfahan, East Azerbaijan, Tehran, Khuzestan, Fars, Markazi, Bushehr, Kerman, Yazd, Khorasan Razavi, Hormozgan, Mazandaran, West Azerbaijan, Qazvin, and Qom. The impact of applying this type of tax on the Innovation index of these selected provinces will be analyzed using the Quantile Panel Regression model.

4. Discussion

the results show that the value added of industrial workshops, the value of gross fixed capital formation, employment of university educated people in selected provinces and the export power of industrial workshops have positive effect on research and development costs as innovation index, but the green tax variable has a negative effect on innovation index in the provinces of the studied provinces. thus, porter hypothesis is rejected in the studied provinces.

5. Conclusion and Suggestion

The relationship between environmental taxes and innovation is complex and depends on various factors. While the Porter hypothesis suggests that these taxes can stimulate innovation, it should be noted that these taxes can also have negative effects. To maximize the positive impact of environmental taxes on innovation, these taxes should be appropriately designed and implemented, along with other complementary policies. In addition, it is important to consider the economic context and industrial structure. In general, environmental taxes can be an effective tool for encouraging innovation in clean and sustainable technologies, but this requires precise planning and proper implementation. Based on the research results, it is recommended:

a) The government, through the establishment of the Green Innovation Fund, aims to convert environmental tax revenues into a financial support tool for green research and development, with fair redistribution of profits. In this context, the

transparency of the allocation process, the evaluation criteria for projects, and similar factors should be taken into consideration.

b) In order to reduce the net cost of green research and development in polluting industries, the government should provide a green fiscal incentive for research and development in a targeted and refundable manner, especially for small and medium enterprises. Ultimately, by limiting exemptions for non-green companies, incentives will be directed towards low-carbon technologies.

c) With the help of guarantees and risk funds, the government should participate in reducing the risks and ensuring investment in green research and development projects in major polluting industries.

d) Despite its potential benefits, the implementation of a green tax and its use come with challenges. Small and medium industries may need financial and technical support from the government to adapt to environmental standards and invest in clean technologies. In this regard, it is recommended to identify industries and provide them with support through incentive and promotional packages.

6. Ethical Considerations

6.1. Compliance with Ethical Guidelines

The present study has adhered to the scientific principles and ethical guidelines of research.

6.2. Authors' Contribution

The authors have contributed equally to the writing of this article.

6.3. Conflict of Interest

The authors declare that there is no conflict of interest in this research.

6.4. Acknowledgments

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