

DETERMINANTS OF ENERGY EFFICIENCY INVESTMENTS IN SLOVENIAN MANUFACTURING INDUSTRIES

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Overview

The European Union (EU) has adopted an ambitious target of 20-20-20. The target entails an increase of consumption of energy from renewable sources to 20%, a reduction of the EU greenhouse gas emissions by 20%, and a 20% improvement of energy efficiency by year 2020. Meeting these targets among others require that firms invest in energy efficiency and environmental technologies. Therefore, it is important to understand what factors impact firms' investment decisions. This paper contributes to our understanding of the factors influencing firms' decisions to invest in such technologies before and during the economic crisis. It examines investment decisions of Slovenian manufacturing firms during the period of 2005-2011.

This paper draws on theories of energy efficiency gap (Jaffe and Stavins, 1994; DeCanio, 1993) and energy efficiency paradox as well as on the existing empirical work. Empirical studies in various countries have examined various factors impacting investment decisions (De Canio and Watkins, 1998, De Groot et al., 2001; Velthuisen, 1993; Gillissen and Opschoor, 1995; Sardianou, 2008; Kounetas and Tsekouras, 2008; Arvanitis and Ley, 2013). They tried to identify which factors stimulate firms' decision to adopt energy efficient investments and which are principal barriers that hinder their implementation. The aim of this paper is to contribute to this knowledge by examining investment behaviour of the representative sample of firms in Slovenian manufacturing in the period 2005 – 2011. The 7-year period also allows us to examine whether the financial crisis has hindered or stimulated investments in energy efficiency.

Methods

Our paper examines a sample of about 800 firms in manufacturing industry in Slovenia during the period of 2005 through 2011. Representativeness of the sample is assured by the Statistical office of the Republic of Slovenia (SORS). SORS conducts such surveys annually and follows the requirements of The Joint Harmonised EU Programme of Business and Consumer Surveys. The panel data including the pre-crisis (2005-2008) and crisis years (2009 -2011) allow us to examine whether the financial crisis has slowed down investment plans in energy efficiency in the Slovenian manufacturing industries. Data are combined from four primary sources: (1) the survey on business investments, conducted by the SORS; (2) data from annual reports of firms (balance sheets and income statements), collected by the Agency of the Republic of Slovenia for Public Legal Records and Related Services (AJPES); (3) the survey on R&D activity of Slovenian firms, conducted by the SORS; and (4) data on firms' participation in voluntary environmental management systems (ISO14001) from the Slovenian Chamber of Commerce. The data on investment and R&D activity are confidential and made available to the researchers on the basis of an agreement with SORS.

The paper uses a discrete choice logit model. The dependent variable is dichotomous; value 1 denotes a firm's investment in the energy efficiency and ecological investments in a given year, value 0 absence of such investments. Based on the theoretical foundations, empirical findings from other studies and the data availability we examine the following factors impacting investment decisions: (1) firm level data: ownership type (domestic vs. foreign), profitability (ROA), leverage, innovativeness (firm's R&D activity), energy costs (share of energy costs in total expenditures), firm's market share, exposure to international competition (share of total revenues earned abroad), firm's participation in voluntary environmental management programs (ISO 14001); (2) industry specific factors including industry-specific dummy variables and stringency of environmental regulation; and (3) manager's perceptions of future demand, availability of financial sources and technological expectations, and other regulatory factors (measured by the Likert scale responses to the Investment Survey questions). In addition, we also investigate the impact of the financial crisis using a dummy variable with a value of 1 for years 2009-2011. Another novelty of the study is the assessment of how other types of investments impact the likelihood of the firms to invest in energy efficiency.

Results

The preliminary results of the model indicate that energy intensity, export orientation, the firm's market share and involvement in R&D activity, and favourable managerial expectations about the future demand have a statistically significant and positive impact on the likelihood to invest in energy efficiency and environmental improvements, supporting our hypotheses. The stringency of environmental regulation with respect to CO₂ emissions also has a statistically significant, positive impact on environmental investments, while the positive effect of the environmental commitment (ISO 14001) is not statistically significant. On the other hand the financial crisis, firm's indebtedness, and financial and regulatory constraints do not have statistically significant impact on investments. We furthermore control for the sectoral differences and investigate the impact of other types of investments. Among other types of investments, investments into automation, new production technologies and safety at work have a positive impact, while investments in the enlargement of the existing technologies hinder investments in energy efficiency.

Conclusions

Results from our research contribute to the existing empirical literature identifying principal stimulating factors and barriers to energy efficient investments. The paper adds to the existing empirical work in two ways. First, in addition to factors involved in other empirical studies it examines whether environmental regulation and the firms' environmental commitment influences energy efficient investments under financial constraints. Further, it examines whether other investments crowd-out energy efficiency investments. Second, a large panel data set represents a solid ground for obtaining robust results. The results show that large exporting firms with higher energy costs, favourable demand expectations, and active investments in new production technologies are more likely to invest in energy efficient technologies. These firms also seem to be less affected by financial and economic crisis. Investment in the expansion of existing capacities, which typically do not involve change in existing production technology, have a negative impact on energy efficiency investments.

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