BARRIERS AND ADOPTION OF ENERGY EFFICIENCY MEASURES IN BUILDINGS OF MICRO, SMALL AND MEDIUM-SIZED PORTUGUESE COMPANIES

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Overview

Indispensable nowadays and for future generations, electricity must be used efficiently since it is a scarce resource and have serious repercussions in the environment due to the process of how it is generated. As the International Energy Agency states, "*Energy efficiency* is the one *energy resource that every country* possess in *abundance*" (Sola, 2009) and this is vital to reduce energy bills, improve energy security and also as a tool to combat climate change reducing the pressure in the environment. However, in order to move towards energy efficiency, an initial investment is necessary and even if it is small and conducive to long-term savings MSMEs opt for measures that seem better in the short term emphasizing the importance of the payback period (Jackson, 2010). This paper focuses on micro, small and medium sized enterprises, once they represent 99,9% of the enterprises in Portugal, and can provide information of the demand side to the policy-makers allowing a better understanding on how to go towards energy efficiency. As such, the research question is what does motivate MSMEs to adopt or not energy efficiency measures. This paper intends to assess the adoption of four crosscutting ancillary energy efficiency measures that allows to pass through the organizational and technological heterogeneity of the MSMEs (Olsthoorn, Schleich, & Hirzel, 2017).

Methodology

In front of the absence of secondary data, an online survey was carried out. The survey closely follows the literature and mostly the German questionnaire for energy consumption of the sector trade, commerce and services for the Final report to the Federal Ministry for Economic Affairs and Energy (BMWi, 2013).

In order to guarantee the representativeness of the Portuguese territory, it was decided to widespread the survey by email. Since we could not find a database with the e-mail address of the companies we have used a database with the companies' websites and then proceed to gather them. The data were collected in the period between 8 of November of 2017 and 8 of February of 2018. In a total of 979 surveys that were opened 364(37.18%) were completely answered and submitted.

The survey is compounded by five parts. Part one, two, three and four assess the EEMs lighting, insulation, heating and heating operations, respectively. The procedure is identical for all of them, if the EEM is adopted it is asked how much was invested and how many years does it take to recover the investment. If the EEM was considered but not adopted a set of barriers are shown and it is asked to classify them as important or not important for not adopting. In the fifth part it is asked the remaining information about the MSME.

Regarding the applied methods, the multivariate probit model was used, given that the energy efficiency measures reveal correlation. Moreover, the univariate probit regressions were also carried out to allow a comparison between methods, such as described by (Fleiter, Schleich, & Ravivanpong, 2012)(Fleiter, Schleich, & Ravivanpong, 2012)(Fleiter, Schleich, & Ravivanpong, 2012)(Olsthoorn et al., 2017; Schlomann & Schleich, 2015).

Results

The preliminary results of this research appoint to real new insights about the barriers the Portuguese MSMEs are facing in the adoption of energy efficiency measures. The Pearson's correlation between dependent variables are all positive and statistically significant except for lighting and heating and for insulation and heating operations. We also show the Pearson's correlation between the independent variables. In efficient lighting only the variable of the number of employees is significant and it shows that as the number of employees increases the MSME is less likely to adopt this EEM. Regarding efficient insulation, the model provides empirical evidence in line with the literature (e.g.(Olsthoorn et al., 2017)) showing that MSMEs in rented spaces are less likely to adopt this EEM. Also, the number of employees have a negative relationship with efficient insulation and may be explained as having a larger number of workers, the MSME will have a larger physical space and consequently a higher investment cost. Efficient heating system has a higher adoption rate from: subsidiaries, which suggests that subsidiaries learn through the holding company experience; MSMEs that performed audits since carrying out the audit already demonstrate the desire to be more efficient and for the fact that audits give a more precise information if the measure is a good investment for them; and by the price of electricity purchased (€/kWh), which suggest that MSMEs that pay more for the electricity have a higher benefit in lowering the electricity consumption. Efficient heating operations the adoption is positively correlated with MSMEs that got audited or for those that have an energy manager implying that it is important to have a certain specific knowledge. However, there is a negative relationship with companies belonging to the production sector.

The barriers to EEMs present in the models given as most important for the four EEMs are high investment costs, long return period, higher priority for other investments and rented spaces. However, there is also concern about future electricity prices.

Conclusions

This paper collects primary data about crosscutting ancillary energy efficiency measures and other general information about MSMEs allowing to do a study, based on literature, with the aim of understand how MSMEs take their decisions about energy efficiency. It is noticeable that the decisions and barriers considered by MSMEs are not supported either by audits or by energy management professionals since more than half of the respondents have never performed an energy audit and more than 80% do not have an energy manager.

Our analysis shows us the importance of these aspects for the adoption of SEMs and that they are not properly used. Another relevant factor is the fact that 90% of MSMEs have never applied for financial support for energy efficiency measures.

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