

## **DETERMINANTS ON ENVIRONMENTAL CONTROL INVESTMENT OF BRAZILIAN MANUFACTURING FIRMS**

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Abstract:

In recent years, issues on environmental investments and its determinants have received increasing attention from national and foreign experts, mainly represented by the academic and business communities. That occurs because the environmental investment tends to be the most important thing that a company can do to reduce the pollution generated by firms in their production processes.

This paper presents determinants on environmental control investment of Brazilian manufacturing firms with 30 or more employees in 2007 based on a model of compliance and non-compliance. Statistical modelling techniques for cross-sectional data, such as logistic regression are developed to estimate the probability of investment and a multiple linear regression model is carried out to predict the level of these investments.

The data was obtained from the Annual Industry Survey (PIA Empresa) 2007 and Technological Innovation Survey (PINTEC) 2005, carried out by the Brazilian Institute for Geography and Statistics (IBGE). In addition, administrative data from national patent applications, International Organization for Standardization (ISO) 14001 certification issued by the National Institute of Metrology, Standardization and Industrial Quality (Inmetro), export orientation (SECEX/MDIC) and Joint-stock companies (CVM) was also used.

The adjustment of the multiple regression models, both logistic and linear, was performed taking into account the effect of the sampling plan used in this paper because PIA and PINTEC are surveys that come from complex samples. It should be noted that it was very important to incorporate the effect of the sampling plan in the estimation process, since its disregard would lead to under-or overestimation of the variances of the coefficients, distorting the inferences resulting from the models, then the analysis of the damaging results.

We identify that in the logistic regression model appears variables related with informal pressure (i.e. ISO 14001 certification, export orientation and advertising expenditure), business characteristics, such as management, productivity, size, process innovation, investment rate, and age. Sectoral variables related to formal pressure, ie, those exercised by the government through regulations, are also important. About the linear regression model, which estimates the level of investment in environmental control, we noticed that variables like: size, productivity, investment, age and number of environmental patent applications, are influent in the response of the level of investment in environmental control.

The results suggest that companies belonging to most polluting industries are more sensible to invest in environmental control. Possibly the level of formal pressure practiced by the government in firms that belongs to environmentally sensitive industrial activities are higher because they are more likely to damage the environment.

However, it is clear that consumers have more demanding for environmentally products which can be determined by the environmental labeling. This seems that even though there is a strong influence of government in less polluting industries, they should be prepared to face more pressure from the market in the future. In this sense, it is identified that the market pressures are already perceived by firms. Increasingly, large and medium-sized organizations are seeking to implement environmental management systems, for example, ISO 14001 certification, as a response to society that they are aware in searching a better environmental performance.

We can also observe, as a result, that companies that often invest in acquisition of modern machinery and equipment or looking to develop new production processes become more effective, both environmentally and economically. Companies that frequently invest in environmental control tend to be more updated and prepared to meet the varying pressures required by both the market and the government, as they require less investments to the production to bring their cases to new environmental requirements.

In addition, there is evidence that variables related to process innovation, number of environmental patent applications, advertising expenditure, investment rate, years of operation, export orientation, and purchases of machinery and industrial equipment of third parties are also related to the probability or the level of investment in environmental control of manufacturing firms in Brazil in 2007.