INDUSTRY LEVEL PRODUCTION FUNCTIONS AND ENERGY USE

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Overview

The industrial sector uses more delivered energy than any other end-use sector, consuming about 54% of the world's total delivered energy. Additionally, industrial sector energy consumption is projected to increase by an average of 1.2%/year worldwide. Despite the importance of energy use by industry, there are few studies examining the effect of energy consumption on industrial output by sectors. The aim of this study is to analyze this effect within a growth framework in nine European countries. With this purpose, industry-level translog production functions are estimated by using panel data from 9 European countries and 1995-2011 period. Productive energy use, physical capital and total employee hours are considered as production factors.

Methods

Industry-level translog production functions are estimated for the case of 3 factors (physical capital stock, productive energy use and total employee hours) by using panel data referring to 9 European countries along the period 1995 to 2011. The translog production functions are estimated for ten industry levels: Food and beverages, textiles, wood, pulp and paper, chemicals, non-metallic, transport equipment, other manufacturing, mining and construction. The parameters are estimated empirically through panel data techniques. Positive values of the coefficients of terms with cross-products of the variables indicate there is complementarity between the corresponding productive factors, while negative values of those coefficients indicate there is substitutability between them. The coefficients of the quadratic terms characterize the returns to scale.

Results

In general, the obtained results indicate that the elasticity values for energy in the central point of the sample are small or insignificant for all sectors. The highest elasticity value is observed in the textil sector, while the lowest values are observed in wood, mining and construction. Substitutability relationships between energy and physical capital are observed in chemicals, food and beverages, mining and wood, while complementarity relationships is observed in the pulp and paper and transport equipment sectors. Similarly, it may be noted that the parameters of the squared terms of energy use proves to be positive and significant in wood, food and beverages sectors, implying increasing returns.

Conclusions

This study analyses the role of energy in the industry growth for ten sectors by estimating translog production functions. Thus, the strength of the link between energy and growth in the industry is studied. The productivity elasticity with respect energy use varies throughout sectors being positive and low for all them. These positive values represent the potential negative impact on economic growth due to energy conservation policies for cutting down emissions. In some sectors, substitutability relationships between physical capital and energy used are observed. Therefore, increases in energy efficiency are available through increased capital purchases.

References

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