CALCULATING ENERGY EFFICIENCY: THE CASE OF STEEL PRODUCTION

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1. Overview

This paper analyzes energy efficiency of steel across top steel producing countries since iron and steel industry has some of the highest levels of emissions and energy consumptions. We calculate both the direct and indirect effects (substitution effects through energy consumption) of prices of factors of production on energy efficiency of steel production. While a similar analysis has been performed for European countries (see Flues 2015) that only dominate 7% of the market, the analysis has not been performed for top producers such as US, China, Russia, Japan, and India which will be the focus of this project. In addition, to our knowledge there have been little or no attempts to study energy efficiency of steel production that involve the economic climate. For example, Wei (2007) examine the change of energy efficiency in China's steel market. The authors use fuel oil, natural gas, electricity; coal, including fuel coal and coking coal; and coke. We do a multi-country analysis that involves not only input prices, but also GDP and investment while studying energy efficiency of steel production.

2. Methods

A Generalized Least Squares Estimator for panel data has been used that allows for correlation of errors across countries. Input prices like that of iron ore, coking coal, gas, and electricity have been used along with economic features such as GDP, wages, and investment. We allow for the fact that industrial energy demand is susceptible to international effects (Inui 1996). Data has been obtained from International Energy Agency, OECD Main Economic Indicators Database, and the United Nations.

3. Results

We find that as energy prices go up, the substitution effect decreases production of steel, but rebound effects cancel out some of those effects. Eventually, individual economic conditions and investment climate play a bigger role. Our research highlights the role of regulations and finance in emissions in the steel industry. Our results provide impetus to further study energy efficiency and carbon emissions in energy intensive industries. We also find evidence of declining energy intensity during recessions and rising energy intensity during expansions. This is consistent with Boyd and Ross (1986).

4. Conclusions

My work is especially important given the current economic and political climate with the proposed tariffs on steel. My work will provide trade analysts, financial advisors, and international economic organizations a framework to refer to while trying to determine the impact of various steel inputs, changes in energy prices, and changes in economic climate. Moreover, they will be able to do this for with confidence for different countries.

My work reveals businesses the energy and economic factors that are associated with a reduction in the specific energy consumption in iron and steel production and emissions. In addition, my work show the differences across countries in use of coal and natural gas and estimates of rebound effects across the top steel producing countries; this will help policymakers and producers form decisions on pricing, taxes, and regulations in the future.

References

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