LESS MATERIAL PROJECT[1]

The Rebound Effect of Resource Efficiency: Materials and Energy[2]

by Sedat Alataş, 29 September 2023

The "rebound effect" is a phenomenon which occurs when potential resource savings driven by advances in resource efficiency are cancelled out due to a variety of reasons, such as the substitution effect, income effect, market dynamics, or psychological factors. In other words, when the rebound effect prevails, even if industries or people use resources efficiently and perform better, the benefits of the improvements in resource efficiency are partially or completely offset by increasing consumption and production [2].

The Intergovernmental Panel on Climate Change (IPCC) estimates that energy and material efficiency, two essential components of resource efficiency, have a large potential to reduce emissions by 2030, especially for the industry sector [3]. It is also discussed that focusing solely on one resource could be misleading when it comes to choosing an effective policy and the comparisons of energy and material rebound effects might be necessary for a better understanding of resource interlinkage [4]. It is because if energy or material efficiency policies are implemented without taking rebound effects into account, they may not result in the expected reductions in energy and materials consumption and emissions. In this context, developing effective resource efficiency policies and sustainable consumption strategies requires an understanding of the accurate causes and magnitudes of rebound effects. However, due to the dominance of energy-based mitigation strategies in the design of climate policies, material efficiency still represents an unexplored option for reducing emissions, and, more importantly, the crucial importance of the rebound effect of resource efficiency (particularly with materials) is often ignored. This pattern is also evident in academic literature, where researchers typically approach the issue of climate mitigation from an energy-based perspective and ignore both the potential for material efficiency policies and the associated rebound effects.

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[2] This blog post is based on our paper entitled "The Rebound Effect of Material and Energy Efficiency and Their Determinants: Insights from the Stochastic Frontier Analysis for the EU and its Major Trading Partners” (written by Etem Karakaya, Sedat Alataş, Elif Erkara, Betül Mert, Tuğba Akdoğan, and Burcu Hiçyılmaz). Please see the preprint version of the full paper: http://dx.doi.org/10.2139/ssrn.4501943 [1] Sedat Alataş can be reached at sedat.alatas@adu.edu.tr.

Figure 1 Material efficiency and the rebound effect

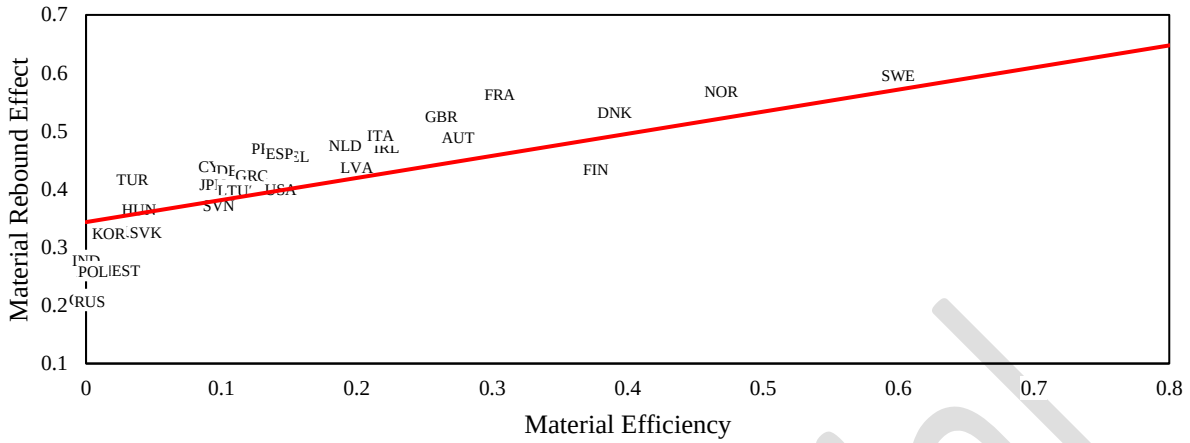
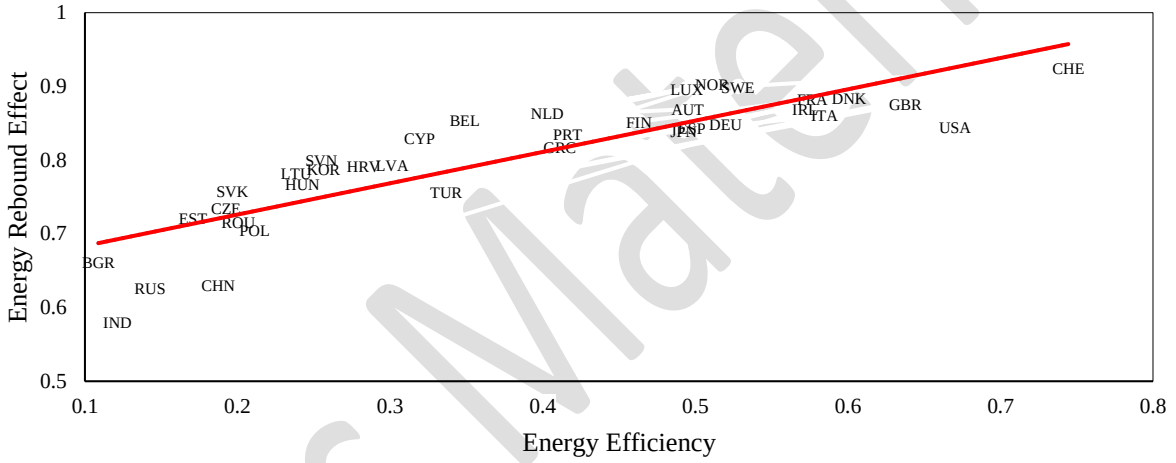


Figure 2 Energy efficiency and the rebound effect



In our recent research article, we assess the material and energy efficiency performances and their rebound effects for the European Union (EU) countries and their main trading partners. The results reveal that more developed EU members generally outperform less developed EU members and trading partners in terms of material and energy efficiency. Our empirical analysis demonstrates the rebound effects from resource efficiency implementation. We find a positive link between efficiency gains and rebound effects for both material and energy consumption, as illustrated in Figures 1 and 2. The results also show that while energy efficiency scores are relatively higher, material efficiency performances are lower, but improving over the years. The rebound effects of energy efficiency exceed those of material efficiency, implying that energy reduction potentials are largely offset. These findings suggest that there is still a lot of room for improvement in material efficiency due to the relatively low rebound effects and increasing material efficiency trend.

References

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