

Summary and abstract of article

Towards a Theory of Psychological Rebound Effects

As part of the Special Session „Energy, Efficiency, and Growth - Analyzing Rebound Effects“

Short Summary:

Research on rebound effects at the consumer level until today has been almost exclusively limited to the realm of economic sciences. Accordingly explanations of how rebound effects arise are restricted to economic theories, namely to income and substitution effects. This article analyzes rebound effects through the lenses of various social and behavioral science theories. The article applies the Theory of Planned Behavior (Ajzen, 1991), the Norm Activation Model (Schwartz, 1977), the Moral Balance Model (Nisan, 1991) as well as Festinger's (1957) theory on cognitive dissonance to generate several hypothesis how energy efficiency improvements may change consumer preferences, and thus lead to positive or negative rebound effects. The article substantiates these hypotheses with qualitative evidence from focus groups that have been performed in the general public in Germany by Peters et al. (2012) as well as with quantitative data from studies that look at correlated cases. It presents a 'typology of psychological rebound effects', highlights limitations of this approach, and develops main research questions how to further explore the issue.

Long Abstract:

Increasing the energy efficiency of production and consumption is an important strategy to achieve sustainability policy goals. However an increase in energy efficiency does not necessarily equal a decrease of absolute energy demand (Wilhite & Norgard, 2004). Most notably from an environmental perspective, the efficiency strategy brings about 'undesired side effects' (Santarius, 2012): technological efficiency improvements may indeed lead to a reduced use of energy per unit of production or service, but at the same time they may raise demand of these services – which runs counter to the goal of saving energy. Such increased demand of energy services caused by increased energy efficiency is defined as a 'rebound effect'.

The causal link between increased energy efficiency and increased energy demand was already identified by Jevons in 1865 (Jevons, 1906) but had literally been forgotten for more than 100 years. Since the late 1970s, the rebound effect has been rediscovered and a vital scientific discussion has emerged. However research and publications so far have been almost exclusively limited to the realm of economic sciences, and explanations of how rebound effects arise and function are restricted to economic categories and theories.

Mainly economic reasoning suggests that efficiency improvements can have a price content, i.e., safe money, which will incentivize consumers to increase demand. By explaining rebound effects through either income or substitution effects (Khazzoom, 1980; 1987; Berkhout et al.,

2000; Birol & Keppler, 2000; Binswanger, 2001; and many others), economic rebound research relies on multiple assumptions about human behavior and consumer choice. These assumptions have for the most part been neglected in existing rebound publications. For instance economic analysis of rebounds usually rests on a simple model of rational choice behavior, which assumes that consumers will a) act rationally, b) according to cost-benefit-considerations, and generally c) maximize their personal benefits. Such assumptions of simple rational choice models can be criticized from the perspectives of more comprehensive models of human behavior (Simon, 1947; 1957; Granovetter, 1985; Zey, 1992; Max-Neef, 1992; Russell, 2000; Scott, 2000), and the utilitarian notion of insatiability of needs. As this article investigates rebound effects through the lenses of various theories of behavioral sciences and psychology, it reflects on the validity of economic rebound reasoning and offers additional explanations how and under what conditions rebound effects may occur.

Aim and methodology of this article

This article presents a theory and typology of ‘psychological rebound effects’ that are caused by cognitive, emotional, and affective factors shaping the interrelationship between technology and human behavior.

The starting point is that energy efficiency improvements may change the symbolic value of products and services respectively. And as the symbolic value of a given product changes, this in turn can alter consumer preferences. For instance ‘green’ or ‘climate-friendly’ technologies may positively affect consumers’ attitudes towards using them, leading to increased usage. Likewise efficiency improvements may diminish any social stigmatization of energy-intensive goods, making them appear more socially accepted to consumers and thus encouraging demand. So while income and substitution effects explain rebounds according to the price content of energy efficiency improvements, ‘psychological rebound effects’ suggest separate effects according to the symbolic and social content of efficiency improvements. Accordingly psychological rebound effects are defined as an increase in energy service demand due to a change in consumer preferences that can be attributed to an increase in technological energy efficiency.

This article explores the concept of psychological rebound effects with a four step methodology. First, the article summarizes the economics of rebound effects and critically reflects potentially deficiencies of the rational choice model. Second, after psychological rebound effects have been defined, the article applies several behavioral and social science theories and uses them to explain potential rebound effect. Along the lines of the Theory of Planned Behavior (Ajzen, 1991), it discusses whether and how improvements in the efficiency of a given technology can generate attitude, social norm, and perceived behavior control of one’s person towards using a the respective technology. Applying the Norm Activation Modell (Schwartz, 1977), the article discusses whether and how energy efficiency improvements may change a person’s awareness of adverse consequences and ascription of responsibility. Alongside the *Moral Balance Model* (Nisan, 1991), it is finally discussed how a decision to perform or refrain from a certain moral action – e.g., using a given technology – depends on moral actions a person has performed in the past – e.g. having bought the most energy efficient version of that technology. Overall, these theoretical considerations will show how energy efficiency improvements may actually lead to a re-appraisal of consequences,

costs, benefits, responsibility, and control. Eventually, thus, several hypothesis are outlined how these re-appraisals may change consumer preferences to using an energy efficient product or service more often, or less often.

As a third step in this article's methodology, qualitative empirical evidence will be analyzed to substantiate the hypotheses on psychological rebound mechanisms. The article conducts a secondary analysis of outcomes from focus groups with the general public that Peters et al. (2012) have been conducted. Quote from focus group members on their motivations and preferences towards using more or less energy efficient technologies and products allow for a clustering of hypothesis into several categories of psychological rebound effects. This categorization forms the backbone of this article's typology of psychological rebound effects.

Finally, the article performs a literature review of studies from related fields in order to back some of the hypothesis and the typology of psychological rebound effects with quantitative data. Yet this can only be done in a cursory manner, since no study so far has investigated psychological rebound effects directly. However, several related studies on moral licensing, consumer behavior of 'green products' allow for some cross-generalization. The article closes with discussing open questions, moderating factors, and – most notably – questions for further quantitative and qualitative research on psychological rebound effects.

State of research on psychological rebounds

At the time this article is handed in for review at the Degrowth conference, literature on 'psychological rebound effects' can be counted on one hand. Greening et al.'s (2000) seminal rebound review differentiates 'transformational effects' as one out of four types of rebounds, but does not dive into analysis: "*Changes in technology also have the potential to change consumers' preferences, alter social institutions, and rearrange the organization of production. We refer to these potential effects as transformational effects. However, there is no all-inclusive theory for predicting those effects, which could result in more or less energy consumption. (...) Therefore, for this discussion we have chosen to neglect transformational effects.*" (Greening et al., 2000, p. 391f.) Girod & de Haan (2009) are the first to analyze psychological rebound effects, but still remain in economic rational choice thinking as they conceptualize what they term 'mental rebounds' with Thaler's mental accounting framework (Thaler 1985). Paech (2011) and Santarius (2012) provide essayistic introductions into social and behavioral science perspectives on psychological rebound effects. Arnold & Otto (2013) highlight psychological effects but neither analyze them nor suggest a theoretical framework to do so. Peters, Sonnberger, Dütschke, and Deuschle (Peters et al., 2012a) deliver the most comprehensive approach to psychological rebounds and suggest a robust framework how to empirically investigate them. In addition Peters, Sonnberger, and Deuschle (Peters et al., 2012b) have conducted focus groups on psychological rebounds with the general public in Germany. Yet Peters et al. lack to advance their findings into an approach to theorizing psychological rebound effects – the main aim of this article. The qualitative results of the Peters et al. (2012b) focus groups study will be used and quoted throughout this article in order to achieve this.

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