Energy Policy 94 (2016) 114–125

Contents lists available at ScienceDirect

Energy Policy

journal homepage: www.elsevier.com/locate/enpol

How to deal with the rebound effect? A policy-oriented approach

David Font Vivanco [a,*], René Kemp [b], Ester van der Voet [a]

[a] Institute of Environmental Sciences (CML), Leiden University, 2300 RA Leiden, The Netherlands
[b] ICIS and UNU-MERIT, Maastricht University, 6200 MD Maastricht, The Netherlands

HIGHLIGHTS

- Policy inaction on the rebound effect issue is investigated for the case of Europe.
- Rebound mitigation strategies and policy pathways are proposed and analysed.
- Policy inaction is partly explained by the unsuccessful push from academics.
- The importance of policy design and policy mix for rebound mitigation is revealed.
- Economic instruments stand out in terms of rebound mitigation potential.

ARTICLE INFO

Article history:
Received 24 September 2015
Received in revised form
19 February 2016
Accepted 31 March 2016
Available online 15 April 2016

Keywords:
Rebound effect
Consumption
Environmental policy
Energy efficiency
Europe

ABSTRACT

Policy makers and environmental agencies have echoed concerns brought forward by academics about the need to address the rebound effect for achieving absolute energy and environmental decoupling. However, such concerns have generally not been translated into tangible policy action. The reasons behind this inaction are not fully understood, and much remains unknown about the status of the rebound effect issue on the policy agenda and policy pathways available. Such knowledge gaps may hamper the development of effective policies to address this issue. In this paper, we examine the extent to and ways in which the rebound effect is considered in policy documents and analyse thirteen specific policy pathways for rebound mitigation. The effectiveness of the pathways is scrutinised and conclusions are offered to mitigate rebound effects. The main policy conclusions of the paper are that an appropriate policy design and policy mix are key to avoiding undesired outcomes, such as the creation of additional rebound effects and environmental trade-offs. From the discussion, economy-wide cap-and-trade systems as well as energy and carbon taxes, when designed appropriately, emerge as the most effective policies in setting a ceiling for emissions and addressing energy use across the economy.

1. Introduction

Sustainable consumption policies worldwide are largely shaped by the notion of resource and environmental efficiency, i.e., seeking to reduce the amount of environmental pressures per unit of product (e.g., Kilowatt-hour) or function/service (e.g., energy services such as lighting) demanded. However, while energy and resource efficiency has been continuously increasing through history, largely due to technological innovation (Ayres and Warr, 2005; Smil, 2003), absolute environmental pressures for many indicators have continued to rise (e.g., primary energy consumption or raw material consumption) (Herring and Roy, 2007). This paradox can be explained using the IPAT equation concept devised by Ehrlich and Holdren (1971), which describes environmental impacts (I) as a product of population growth (P), affluence (A) and technology (T). Thus, according to the IPAT equation, technological improvements have not been able to offset pressures from increases in population and consumption.[1] In other words, while there has been a substantial relative decoupling (a decrease in the environmental impacts per unit of economic activity, observed through the 'technology' factor), absolute decoupling (an absolute decrease in environmental impacts, observed through the 'impact' factor) has not been achieved for most pressures. Moreover, an

[1] While the term 'affluence', an indicator measuring economic activity as a whole, is generally measured in the literature as gross domestic product per capita, it is often assumed that it is consumption in a broader sense (economic activity other than the design, production and marketing of goods and services) that drives overall economic activity (Alcott, 2010).

* Corresponding author.
E-mail addresses: david.fontvivanco@yale.edu, dfontv@gmail.com (D. Font Vivanco).

http://dx.doi.org/10.1016/j.enpol.2016.03.054

important body of scientific literature goes even further by describing a negative relationship between technology and consumption in some cases; that is, the rationale that improvements in technological efficiency (and, in a broader sense, efficiency improvements in general (Gillingham et al., 2015; Schaefer and Wickert, 2015)) have induced increases in consumption. This mechanism is generally known as the rebound effect theory, which has been defined as the additional energy consumption from overall changes in demand as a result of behavioural and other systemic responses to energy efficiency improvements (Binswanger, 2001; Brookes, 1990; Khazzoom, 1980; Saunders, 1992). An example of the rebound effect is the way in which fuel efficiency improvements in passenger cars have made driving cheaper, resulting in users driving more and buying bigger cars (direct effect) and/or spending the remaining savings on other products (indirect effect). As a result, total fuel and energy savings are reduced. In the latter case, we speak of a backfire effect (Saunders, 2000). When dealing with broader environmental aspects rather than energy use alone (as generally defined by the traditional energy economics literature), we speak of an environmental rebound effect. This re-interpretation of the original energy rebound effect allows for broader assessments as well as more comprehensive results in the context of environmental assessment (Font Vivanco et al., 2014a).

The existence and relevance of the energy or environmental rebound effect (hereafter referred to as the "rebound effect") has been acknowledged by many credible sources from both the academic and the public policy domains. Dozens of research studies have identified and empirically analysed the rebound effect since the early works of William Stanley Jevons (1865). Comprehensive and updated summaries of such findings can be found in Sorrell (2007), Jenkins et al. (2011). Likewise, various intergovernmental organisations and international agencies have also echoed concerns about the impact of the rebound effect on global sustainability. Some examples of concerned entities include the United Nations Environment Programme (UNEP, 2002), the International Energy Agency (IEA, 2012), the European Commission (EC, 2012b) and the European Environment Agency (EEA, 2013). These concerns, however, have generally not been translated into any tangible policy action (IRGC, 2013; Maxwell et al., 2011). The reasons behind this inaction are not fully understood, and much remains unknown about the status of the rebound effect issue on the policy agenda as well as the range of policy pathways[2] available. While qualitative research has yielded reasonable explanatory causes behind inaction (Levett, 2009; Nørgaard, 2008; Schaefer and Wickert, 2015), a still unexplored explanation relates to the role of the scientific community in shaping the policy agenda (Hempel, 1996). Regardless, the evidence currently available has spurred an emerging discussion on how to address the rebound effect through policy. Three policy strategies to mitigate the rebound effect can be distinguished: (1) economy-wide increases in environmental efficiency, (2) shifts to greener consumption patterns and (3) downsizing consumption (Girod et al., 2014). It is worth noting that while these strategies are also valid for broader environmental policies, in this article, they will be discussed only in the context of rebound mitigation. However, the complete range of policy pathways and how they relate to these strategies is generally unknown. Such knowledge gaps may hamper the development of effective policies to address the rebound effect.

This study aims to contribute to this growing field of research by addressing the following two general questions:

1. What is the state of play of the rebound effect issue on the policy agenda and what is the role of the scientific community?
2. What policy pathways are available and which of them could be more effective to mitigate the undesired consequences of the rebound effect?

The remainder of this article is organised as follows. Section 2 addresses the first research question and investigates the reasons behind policy inaction through a case study on the European Union (EU). The second research question is addressed in Section 3, which presents a number of general strategies and specific pathways for rebound mitigation and discusses their potential effectiveness. Section 4 presents a general discussion on the success of the European scientific community in introducing the rebound effect issue into the policy agenda and how to make rebound policies more effective. Section 5 concludes the article by discussing the value, limitations and potential impact of the findings.

2. The rebound effect as a policy issue: the case of the European Union

In this section, we address the first research question by seeking insight into the current policy inaction to address the rebound effect issue, focusing on the impact of the scientific community. For this, we focus on the EU legislation as a case study. While the EU states retain considerable legislative initiative on energy and other environmental issues, the exploratory nature of this study justifies the decision not to broaden the scope of our analysis. The objective of this exercise is to uncover to what extent the rebound effect is considered in EU policies (as revealed through policy document analysis), as well as to gain insight into the role of the scientific community. It is not the aim of this paper to systematically address the causes underlying policy inaction but rather to complement and contextualise previous qualitative research (Levett, 2009; Nørgaard, 2008; Schaefer and Wickert, 2015). The methodology consists primarily of a keyword search of the term 'rebound effect' through the EUR-Lex search engine (EC, 2014b) and a detailed analysis of the identified documents. Only those documents in which the term is used in the context of energy/environmental assessment are included, thus excluding alternative understandings (e.g., pharmacological). The EUR-Lex is an official service that allows the consultation of the Official Journal of the EU and provides the ability to search all types of legal acts, including treaties, international agreements, legislation and preparatory acts. Cross-citation analysis from the documents identified through the previous approach has also been carried out to survey other relevant documents in which the rebound effect is not explicitly mentioned, but alternative labels such as the 'take-back effect'. Lastly, experts with a publication record on the topic of rebound effect and policy analysis have been consulted to ensure that no relevant documents have been omitted in the previous analysis.

As of the writing of this study, a total of 35 legal acts acknowledge the existence of the rebound effect. From this survey, we observe that the rebound effect has increasingly found its way into the EU policy documents over almost two decades. The first mention of the rebound effect in a legal act appears in the year 1996 in a communication from the former Commission of the European Communities (CEC) entitled 'The information society: From Corfu to Dublin. The new emerging priorities' (CEC, 1996). In this communication, the CEC voiced concerns over the creation of additional demand for material consumption as a consequence of developments in information and communication technology (ICT). The issue was then ignored for a decade until it was brought

[2] By a policy pathway we mean the enforcement of any type of policy items from the policy cycle (e.g., agenda setting, formulation, decision-making, implementation and evaluation).