



ELSEVIER

Contents lists available at ScienceDirect

Resource and Energy Economics

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

Organisational change and the productivity effects of green technology adoption[☆]

Hanna Hottenrott^{a,b,c,1}, Sascha Rexhäuser^{b,*},
Reinhilde Veugelers^{c,d,e,2}

^a TUM School of Management, Technische Universität München, Arcisstrasse 21, 80333 München, Germany

^b Centre for European Economic Research (ZEW), L7, 68167 Mannheim, Germany

^d Katholieke Universiteit Leuven (KU Leuven), Naamsestraat 69, 3000 Leuven, Belgium

^d Research Fellow at Centre for Economic Policy Research (CEPR), London, United Kingdom

^e Bruegel, Rue de la Charité, 33-1210 Brussels, Belgium

ARTICLE INFO

Article history:

Received 28 April 2015

Received in revised form 1 November 2015

Accepted 4 January 2016

Available online 9 January 2016

JEL classification:

D23

O33

O32

ABSTRACT

This study investigates induced productivity effects of firms introducing new environmental technologies. The literature on within-firm organisational change and productivity suggests that firms can achieve higher productivity gains from adopting new technologies if they adapt their organisational structures. Such complementarity effects may be of particular importance for the adoption of greenhouse gas (GHG) abatement technologies. The adoption of these technologies is often induced by public

[☆] The authors thank Martin Achtenicht, Jurriën Bakker, Benjamin Balsmeier, Bruno Cassiman, Dirk Czarnitzki, Carolyn Fischer, Francois Laisney, Bettina Peters, Christian Rammer, and Michael Schymura as well as the participants in the session Competitiveness and Trade III at the 19th annual conference of the European Association of Environmental and Resource Economists (EAERE) in Prague (Czech Republic) and participants at the 39th Conference of the European Association for Research in Industrial Economics (EARIE) in Rome (Italy) as well as participants of a seminar at the University of Heidelberg and the Katholieke Universiteit Leuven for very helpful comments. This research was done within the framework of the research program “Strengthening Efficiency and Competitiveness in the European Knowledge Economies” (SEEK). We gratefully acknowledge funding from the government of Baden-Württemberg.

* Corresponding author. Tel.: +49 062115967581.

E-mail addresses: h.hottenrott@tum.de (H. Hottenrott), rex85@gmx.de (S. Rexhäuser), reinhilde.veugelers@kuleuven.be (R. Veugelers).

¹ Tel.: +49 (0)89 28925741; fax: +49 (0)89 28925742.

² Tel.: +32 16326908; fax: +32 163267320.

<http://dx.doi.org/10.1016/j.reseneeco.2016.01.004>

0928-7655/© 2016 Elsevier B.V. All rights reserved.

Q55
L23
D24

Keywords:

Technical change
Environmental innovation
Organisational change
Productivity

authorities to limit the social costs of climate change, whereas the private returns are much less obvious. This study finds empirical support for complementarity between green technology adoption (either CO₂-reducing or resources and energy efficiency-enhancing technologies) and organisational change. While the sole adoption of green technologies is associated with lower productivity, the simultaneous implementation of green technologies and organisational innovations is not.

© 2016 Elsevier B.V. All rights reserved.

1. Introduction

Research on firm organisation has long emphasised the importance of organisational structures for efficient technology use. Caroli and Van Reenen (2001, p. 1450), for example, make this point explicit by arguing that: “Without the organizational and skill infrastructure, technology alone is not enough.” Studies dealing with environmental technology, however, have largely ignored this stream of literature. This previous research focusses mainly on the role of governmental regulation for abatement technology adoption and its consequences for firms’ productivity and competitiveness. The question of how abatement technologies integrate into the firms’ operations and what factors determine their efficient adoption remained largely unexplored.

An exception is Bloom et al. (2010) who suggest that better managed firms have lower energy intensities and that advanced environmental management is associated with higher productivity. Further research by Martin et al. (2012) also offers evidence in favour of this view. However, both studies do not allow us to conclude that environmental management improves the marginal returns to environmental technology adoption in the sense that both have complementary effects on productivity.

In this study, we focus on the complementarity between green technology adoption and organisational change in manufacturing firms. In particular, we study whether firms that are open to organisational changes (i.e. firms that have introduced organisational innovations) can be more efficient in adopting new green technologies which translates into productivity gains.

Such efficiency improvements may translate into productivity gains in the adopting firms. Take the example of BASF. BASF is the world’s biggest leading chemical company and a large-scale emitter of greenhouse gases. To improve energy efficiency and to reduce greenhouse gas emissions, BASF uses environmental technologies such as combined heat and power, i.e. the technologies for the use of waste heat and the incineration of deposits from production. In addition, BASF has implemented the “Energieverbund” (energy compound) system which organises the supply of energy from these energy recovery technologies to their various plants. The “Energieverbund” “[...] therefore offers [...] a crucial competitive advantage, while also having a positive impact on the environment” (BASF, 2014). The BASF example illustrates how firms may combine an environmental innovation with new organisational designs and infrastructures to better exploit the opportunities provided by such technologies.

In the following, we consider green technology adoption as the implementation of any technology that reduces CO₂ emissions. This also includes cases in which CO₂ reduction can be achieved by using fossil fuel inputs more efficiently and are therefore related to energy-efficiency.³ In addition to greenhouse gas (GHG) mitigation technologies we also consider sustainable innovations (i.e. material or resource-saving innovations). The selection of these two aspects of green technology is motivated by the fact that both are integrated process technologies, i.e. no end-of-pipe or other

³ Improving the efficiency of fossil fuel use requires the installation of new capital goods that use fossil fuels at a necessary minimum that is smaller than the levels of currently operated capital. Thus, if fossil fuel inputs and capital are used in rather fixed proportions, increasing efficiency implies the replacement of old capital (Atkeson and Kehoe, 1999).

Download English Version:

<https://daneshyari.com/en/article/985608>

Download Persian Version:

<https://daneshyari.com/article/985608>

[Daneshyari.com](https://daneshyari.com)