



Hang the low-hanging fruit even lower - Evidence that energy efficiency matters for corporate financial performance

Anne Bergmann, Jan Niklas Rotzek, Martina Wetzel, Edeltraud Guenther*

Technische Universität Dresden, Faculty of Business and Economics, Chair of Environmental Management and Accounting, Muenchner Platz 1/3, 01062, Dresden, Germany

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ABSTRACT

Energy efficiency measures are often called low-hanging fruit. First, they significantly lower the energy consumption and therefore contribute to combat global warming. Second, they are considered short-term and cost-effective investments. However, there still exists a gap between existing profitable investments to increase energy efficiency and the corporate reality where organizations do not implement these measures, the so-called energy efficiency gap.

This analysis aims to prove that an increasing level of corporate energy efficiency is directly related to an improved corporate financial performance. The study bases on a multiple regression analysis and considers the manufacturing industry worldwide. Findings indicate a significant positive link. Hence, the study reveals that managers should pay more attention to the implementation of energy efficiency measures, even though they incorporate investment costs. The analysis further contributes to recent research as it takes into account the impacts on corporate financial performance from activities along the corporate value chain. The regression model specifically includes the nine activities of the corporate value chain as variables to control for effects on corporate financial performance. Since gained results provide a higher predictive power, the study calls future research to explicitly consider specific value chain activities when analyzing impacts on corporate financial performance.

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1. Introduction

"There's a lot of low-hanging fruit – this is the area where we can have the greatest environmental impact while making sure that we're creating good jobs and saving businesses and consumers money. So it's a win-win."

Barack Obama before signing the US Energy Efficiency Improvement Act of 2015

(White House, 2015, no pages)

While the IEA (2015, p. 36) states that "energy production and use accounts for around two-thirds of global greenhouse gas (GHG) emissions today, of which carbon dioxide (CO₂) is the great majority" and calls for a reduction across the board, the world wide

energy consumption and related GHG emissions continue to increase. These emissions have already heavily affected global warming and continue to do so today (IPCC, 2014).

Energy efficiency and its further increase represent one of the pathways in order to mitigate climate change (European Commission, 2012). A direct reduction of 25% could be reached by using currently available best technologies. An additional 20% increase of energy efficiency could be reached through innovation (IPCC, 2014).

Prior research comes to the conclusion that, very often, corporations neither recognize the direct impacts of climate change nor take appropriate action to hinder those impacts (Schmid, 2004). In addition to that lack of information (Sardianou, 2008), energy efficiency measures are often related to investment costs (Brunke et al., 2014). Since, on the other hand, the costs for emitting GHGs are still too low to have an effect on corporate decisions, these costs still represent a type of external effect which corporations are not accountable for (TEEB, 2010).

Providing incentives for corporations to increase their current level of energy efficiency represents a solution to reduce current

* Corresponding author.

E-mail addresses: anne.bergmann@tu-dresden.de (A. Bergmann), jan_niklas.rotzek@tu-dresden.de (J.N. Rotzek), martina_wetzel@outlook.de (M. Wetzel), ema@mailbox.tu-dresden.de (E. Guenther).

GHG emissions (Worrell et al., 2009). According to Schmid (2004), there are two options: either the internalization of external effects, e.g. by improving the current GHG trading certificate system; or corporations discover other relevant motives which are related to lower costs and, as a result, to an improved competitiveness (Olson, 2014). Thollander and Ottosson (2010) further conclude that a higher level of energy efficiency leads to improved corporate financial performance (CFP). Considering that CFP is an essential indicator for firm performance and corporate survival in the long term (Hamann et al., 2013), corporations should be quite willing to implement energy efficiency measures.

However, there still exists a gap between existing profitable investments to increase energy efficiency and the corporate reality where organizations do not implement these measures, the so-called energy efficiency gap (first analyzed by Hirst and Brown, 1990). These insights have even found their way into the encyclical letter, 'Laudato si', of Pope Francis (2015). Corporations often focus on other, more economically relevant issues (Sardianou, 2008), such as reducing personnel expenses. They further lack appropriate decision support tools regarding measures for energy efficiency (Trianni et al., 2016) and appropriate cost-benefit analyses (Bunse et al., 2011).

This study tackles exactly the above-described gap and aims to prove that an increasing level of corporate energy efficiency is directly related to an improved CFP and, thus, helps corporations to survive in the long run. To the best of our knowledge, there exists no prior empirical study regarding this relationship. The paper's novelty stems from the narrow perspective on the link between energy efficiency and financial performance of corporations. The study applies a multiple regression analysis and considers the manufacturing industry worldwide. Findings will emphasize that benefits in terms of improved CFP outweigh related efforts to increase energy efficiency. This will foster corporate decision-makers to redirect more attention on energy efficiency and related improvement measures (Pye and McKane, 1999). An increasing level of energy efficiency will also contribute to cleaner production and climate change mitigation (Virtanen et al., 2013).

In addition to prior studies that assess a relationship to CFP, this analysis further presents a first approach to systematically consider impacts of corporate value chain activities (Porter, 1985) on CFP. The study adds the nine value chain activities as control variables in the estimated regression model. Therewith, current practices of controlling for financial impacts are extended and the study contributes to recent research approaches.

The present paper is organized as follows: The following Section 2 provides a literature review on the topics corporate energy efficiency, its barriers, and analyzes studies which focus on the link between increasing corporate energy efficiency and CFP. It further determines impacts of corporate value chain activities on CFP. As a result, two hypotheses are deduced. Section 3 then presents the chosen method and material. The results of the multiple regression analysis as well as the discussion will be presented in Section 4. Concluding remarks are provided in Section 5.

2. Literature review and hypotheses development

2.1. Corporate energy efficiency and its barriers

"Energy efficiency is simply the ratio of energy services out to energy input." (Herring, 2006, p. 11) Philipsen et al. (1997, p. 717) specify energy services as "the amount of human activity (e.g. heating a room to a certain temperature, transporting goods over a certain distance, producing a certain amount of steel)". Prior research provides a bouquet of indicators to express the term of corporate energy efficiency and highlights that the application of

existing indicators depends on the situation and decision to be made (Bunse et al., 2011).

Scientists and policy-makers encourage corporations to enhance their current level of energy efficiency, e.g. via Energy Management Systems along the standard ISO 50001:2011 (Karcher and Jochem, 2015). In general, management attention needs to be directed towards the diverse benefits related to an increase in the current energy efficiency level (Pye and McKane, 1999). Many prior studies conclude that energy efficiency fully addresses all three aspects of the triple bottom line (Bunse et al., 2011). Energy efficiency measures also contribute to energy related as well as non-energy related benefits (Trianni et al., 2014). Well-known examples for non-energy related benefits are increased profitability and improved product quality and output (Henriques and Catarino, 2016).

Yet, there still exists a gap between the potential that energy efficiency measures entail and its implementation by organizations. This phenomenon is defined as the energy efficiency gap and has been researched by several scholars (Chai and Baudelaire, 2015).

To date, barriers which hamper the implementation and cause the energy efficiency gap have been the main research focus. For instance, Trianni et al. (2016) provide an overview of empirical studies on industrial energy efficiency barriers. Recent research identifies economic barriers as almost always the primary issue (Cagno and Trianni, 2014). Among the several reasons for the existence of economic barriers, "technical risks, limited access to capital, and other priorities for financial investments" (Brunke et al., 2014, p. 514) tend to dominate. In addition, hidden costs of energy efficiency investments play a major role (Schmid, 2004). Since prior analyses also identified economic issues such as cost reductions (Apeaning and Thollander, 2013) and potential access to funding (Meath et al., 2016) as the most important driving forces for energy efficiency (Lee, 2015), this study will focus on the economic aspect.

However, existing research that considers barriers and drivers often elaborates on the underlying motives and mechanisms (Hrovatin et al., 2016). For instance, Cagno and Trianni (2014) consider the evaluation's perspective and find that barriers may differ when evaluating them by technology area or at the company level. In contrast, this study takes up the idea of the research stream which investigates the relationship between environmental and financial performance within corporations. This research stream bases on the idea that a redirection of management attention towards the analyzed issue is possible when an overall positive effect on CFP can be proven because CFP is an essential indicator for firm performance and corporate survival in the long term (Hamann et al., 2013). We challenge the hypothesis that energy efficiency represents a low-hanging fruit as it reduces energy costs as well as GHG emissions at the same time. Instead, we aim to hang the low-hanging fruit even lower by contributing with the first empirical proof that an increasing level of corporate energy efficiency is also directly related to an improved CFP.

To do so, we first summarize prior empirical studies from the field. Afterwards, we present our particular research goal and its contribution to research in more detail.

2.2. Prior research on the relationship between energy efficiency and CFP

For more than 40 years, scholars have analyzed the relationship between corporate environmental performance (CEP) and CFP (Guenther et al., 2011). Meta-studies provide evidence that corporations managing their CEP provide a higher CFP than competitors which do not place as much value on corporate environmental issues (Endrikat et al., 2014). One of the most recently published

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