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Corporate investments and environmental regulation: The role of regulatory uncertainty, regulation-induced uncertainty, and investment history

Juan Miguel Rodriguez Lopez ^a, Alice Sakhel ^b, Timo Busch ^{b,*}

^a Centre for Globalisation and Governance, University of Hamburg, Institute of Sociology, Grindelberg 5, 20144 Hamburg, Germany

^b Chair of Management and Sustainability, University of Hamburg, Von-Melle-Park 9, 20146 Hamburg, Germany

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ABSTRACT

The relation between uncertainty related to environmental regulation and corporate investments has received considerable attention in the academic literature. Previous quantitative studies, however, have not distinguished between different types of perceived regulation-related uncertainty and do not consider the potential influence of prior investments on firms' investment decisions. Therefore, this paper analyzes how decision makers' perception of two types of uncertainties – regulatory and regulation-induced uncertainty – affects corporate investments in measures to reduce environmental impact. We analyze survey data from a sample of more than 250 companies participating in the EU Emissions Trading System. The data set includes firms from different industries and countries, and covers the first two periods of the trading scheme. Regression results reveal that regulation-induced uncertainty is positively related to a firm's decision to invest, while we find no statistically significant relation to regulatory uncertainty. Moreover, we find that investment history is positively associated with investments in a specific year, but does not moderate the uncertainty–investment relation.

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1. Introduction

Environmental regulation¹ and awareness of future policy developments are among the most important drivers of corporate responses to ecological challenges (e.g., Kolk & Pinkse, 2004; Okereke & Russel, 2010). Yet, at the same time, policy frameworks often lack predictability and may have unforeseen consequences for the broader competitive landscape. The observation that such uncertainties impact corporate investments has fueled a debate on how firms respond to regulation-related uncertainties (Engau & Hoffmann, 2009). For instance, since the corporate sector is one of the main contributors to global warming, the introduction of climate policies is intended to spur company investments in carbon abatement measures. However, research has disputed

whether such policies actually fulfill their purpose, because the uncertainty inherent in the regulation prevents companies from accurately planning and reduces their willingness to commit resources to such investments (Marcus, 2009; Rogge, Schneider, & Hoffmann, 2011).

This paper examines the relation between uncertainty resulting from environmental regulation and companies' propensity to invest in abatement measures. We define abatement measures as conscious efforts that a firm undertakes for the purpose of reducing its ecological footprint. By conducting a quantitative analysis of different uncertainty-related effects on firm investment behavior, we investigate two important aspects within this relation. First, unlike several previous empirical studies, we do not treat uncertainty as a broad and homogeneous construct. Instead, we build on the definition presented by Hoffmann, Trautmann, and Schneider (2008) and study two different sub-dimensions of regulation-related uncertainties: regulatory and regulation-induced uncertainty. The former describes the uncertainty related to the overall characteristics of and changes in a regulation, such as its scope and rules. The latter represents uncertainty about the indirect consequences of a regulation once it has been implemented, such as changes in market conditions and prices.

* Corresponding author.

E-mail addresses: miguel.rodriguez@uni-hamburg.de (J.M. Rodriguez Lopez), alice.sakhel@wiso.uni-hamburg.de (A. Sakhel), timo.busch@wiso.uni-hamburg.de (T. Busch).

¹ By using the term "environmental regulation", we make reference to legislation that regulates business activities in order to reduce the impact on the natural environment.

Second, we analyze how a firm's investment history influences firm investments given regulation-related uncertainties. While different research streams have shown that a firm's previous decisions are related to future decisions (Vergne & Durand, 2010), so far the literature reveals very little on how regulation-related uncertainty may affect this relation. Specifically, we argue that incorporating investment history into our analysis provides insights into the mechanisms underlying the uncertainty–investment relation. This paper accordingly addresses the following two research questions: do the two different subjectively perceived dimensions of regulation-related uncertainty increase or decrease a firm's propensity to invest in abatement measures? And, in the presence of these uncertainties, what role does a firm's investment history play in its investment decisions?

In order to answer these questions, we analyzed survey data from a sample of more than 250 companies across different sectors and countries (Denmark, the Netherlands, the United Kingdom, and Germany). The data covers the first two phases of the EU Emissions Trading System (EU ETS). Our study contributes to the literature on the uncertainty–investment relation in two main ways. First, we provide a more nuanced perspective on how the two dimensions of subjectively perceived regulation-related uncertainty affect investment decisions. In particular, we show that regulation-related uncertainty may actually drive, rather than, impede corporate investments: in the context of the EU ETS, regulation-induced uncertainty has a positive impact on abatement investment decisions, while regulatory uncertainty does not show a significant effect. Second, we find a highly significant positive influence of investment history on abatement investment decisions – independent of any regulation-related uncertainty. This implies that for effective carbon abatement investments it is central that firms have prior investment experience. Firms without such an investment history might feel compelled by regulation-induced uncertainty to address their inert abatement investment behavior.

The remainder of this article is organized as follows: the second and third sections review relevant literature and derive a number of hypotheses related to the concept of regulatory and regulation-induced uncertainty. The fourth and fifth sections provide background information on the research setting, and present the sample and data, the statistical model, and the analyses' results. In the sixth section, we discuss our results, highlight our main contributions, as well as present some limitations and avenues for future research. The paper ends with a short conclusion in section seven, which concisely summarizes our findings.

2. Literature review: uncertainty and corporate investments in an environmental policy context

The question of how uncertainty affects corporate investment decisions has been the subject of a large number of empirical and theoretical studies. While uncertainty can stem from a number of different sources, a considerable amount of research focuses on how environmental regulations impact firms' decisions. The debate has yielded two opposing views with some scholars arguing that uncertainty discourages firms from investing, while others suggest the uncertainty encourages investment.

The general intuition underlying the former perspective is that, if the outcome of a process is uncertain and potentially detrimental for a company, the option value of waiting to invest increases, which rationally compels the company to postpone investments until uncertainty is partly or fully resolved (Bernanke, 1983; Dixit & Pindyck, 1994). This holds under the assumptions that (a) investments are at least partly irreversible and therefore involve sunk costs, and that (b) firms are flexible when it comes to the timing of their investments (e.g., Dixit & Pindyck, 1994; Pindyck, 1991b).

A considerable number of studies have found empirical evidence for such a postponement strategy (e.g., Pindyck & Solimano, 1993; Pindyck, 1991a; Rodrik, 1991). The real options approach is a common methodology to empirically investigate the uncertainty–investment relation (Dixit & Pindyck, 1994, 1995; Laurikka & Koljonen, 2006). In the context of environmental policies, researchers usually model regulation-related uncertainty as exogenous stochastic fluctuations in carbon prices simulated by means of dynamic programming. Fuss, Johansson, Szolgayova, and Obersteiner (2009), for example, apply a real options model to analyze the adoption of electricity-generating technologies under climate policy uncertainty. Through experimental computation with secondary data, they simulate 10,000 carbon price paths and show that more frequently changing prices (i.e. more uncertainty) enhance the expected value of information and thus result in an increasingly postponed investment in low-carbon technologies. Similar results are obtained by Blyth et al. (2007a) and Kettunen, Bunn, and Blyth (2011), who show that uncertainty in climate policies (e.g., in the form of frequently changing carbon prices) may result in postponed low-carbon investments.

The research advocating the postponement logic stands in contrast to a smaller number of conceptual and empirical studies, which suggest that firms continue to invest – or even enhance the level of investment – despite uncertainty. The theoretical argument for this claim is mainly rooted in the resource-based view of the firm (Barney, 1991; Wernerfelt, 1984). For example, based on a review of the literature, Aragón-Correa and Sharma (2003) develop a theoretical model that shows how characteristics of the general business environment influence the development of a proactive environmental strategy. They propose that in the face of environmental instability firms seek to develop valuable capabilities that help them gain a competitive advantage.

The claims by Aragón-Correa and Sharma (2003) have been supported by a number of empirical studies. Carrera, Mesquita, Perkins, and Vassolo (2003), for instance, looked at the 33 largest Argentinian companies' strategies, analyzing data derived from historical evidence, surveys, and in-depth interviews with chief executive officers. The authors show that uncertainty regarding regulations and the general business environment during four major time periods induced these companies to increase investments in corporate portfolio expansion in order to spread risk. Hoffmann, Trautmann, and Hamprecht (2009) conducted a case study on corporate investment behavior comprising five companies in the German energy sector that participate in the EU ETS. In face-to-face interviews, interviewees were asked questions concerning their perception of regulation-related uncertainty and their investments in technologies that are more pollution efficient. The authors show that in cases of companies wanting to secure competitive resources, leverage complementary resources, or alleviate institutional pressure, regulatory uncertainty did not postpone but actually accelerated investment.

In sum, there is still room for further research on the relation between regulation-related uncertainty and companies' investment decisions. In particular, we see four main issues in the literature that require further attention. First, previous research either defines regulation-related uncertainty narrowly by modeling it, for example, as a price uncertainty, or very broadly by simply referring to it as policy uncertainty. To our knowledge, very few studies make a particular distinction between different dimensions of regulation-related uncertainty. However, a more differentiated investigation of the different uncertainty dimensions could provide a more nuanced picture of uncertainty–investment relation and thus enhance our understanding of the real underlying effects.

Second, earlier studies applying real option models have treated regulation-related uncertainty as an externally given variable,

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